Vol. LIII JANUARY 8th, 1948

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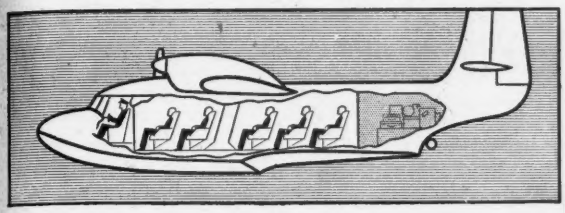

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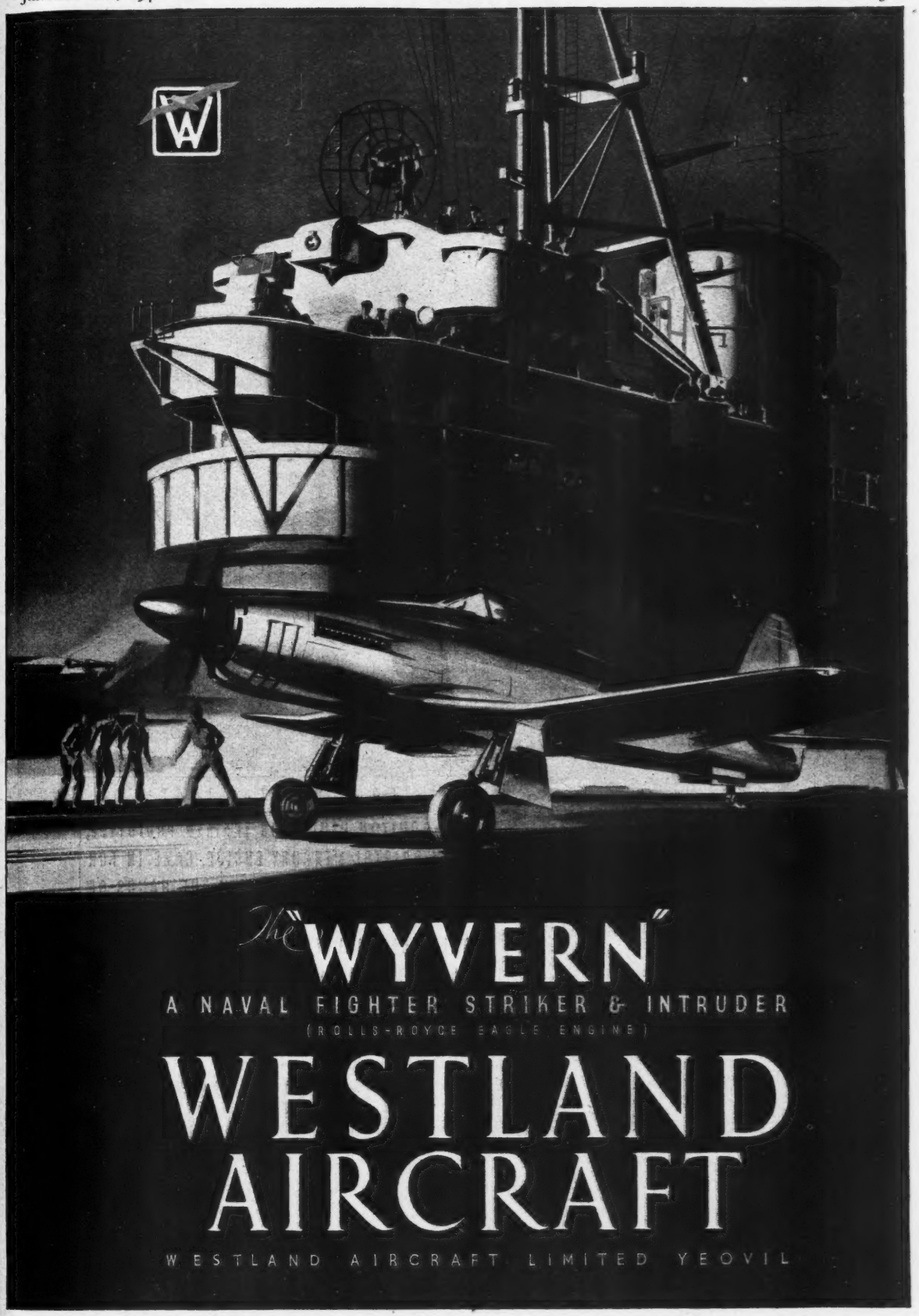
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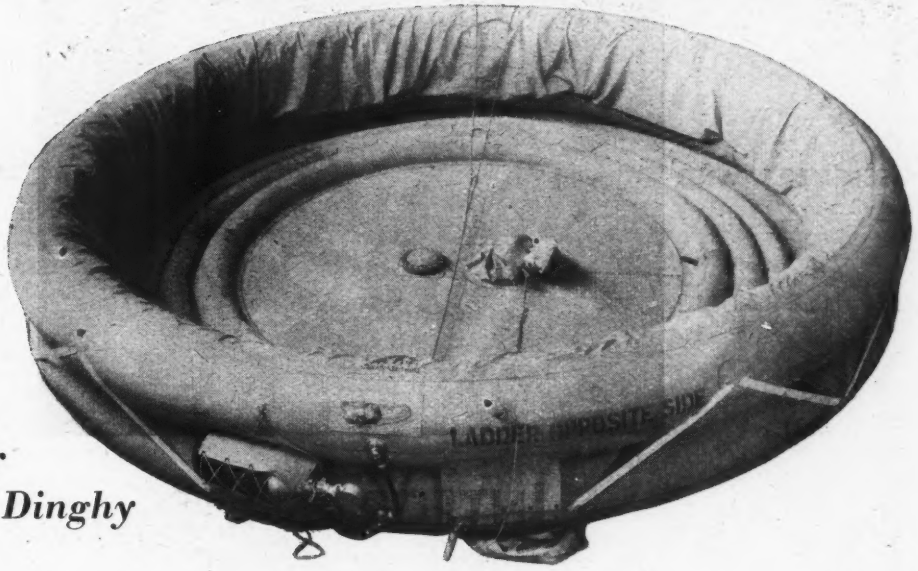

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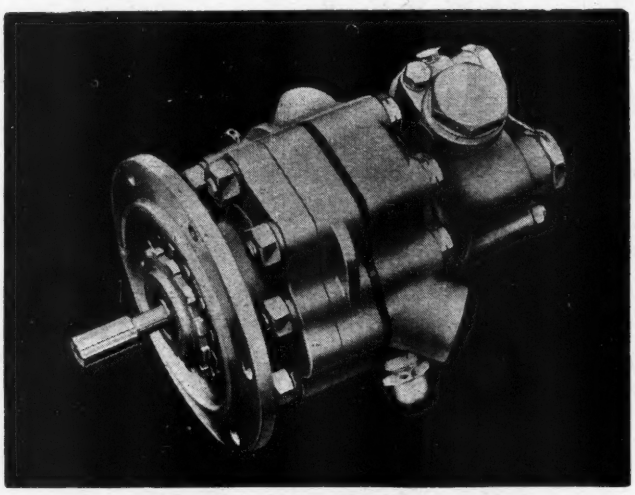

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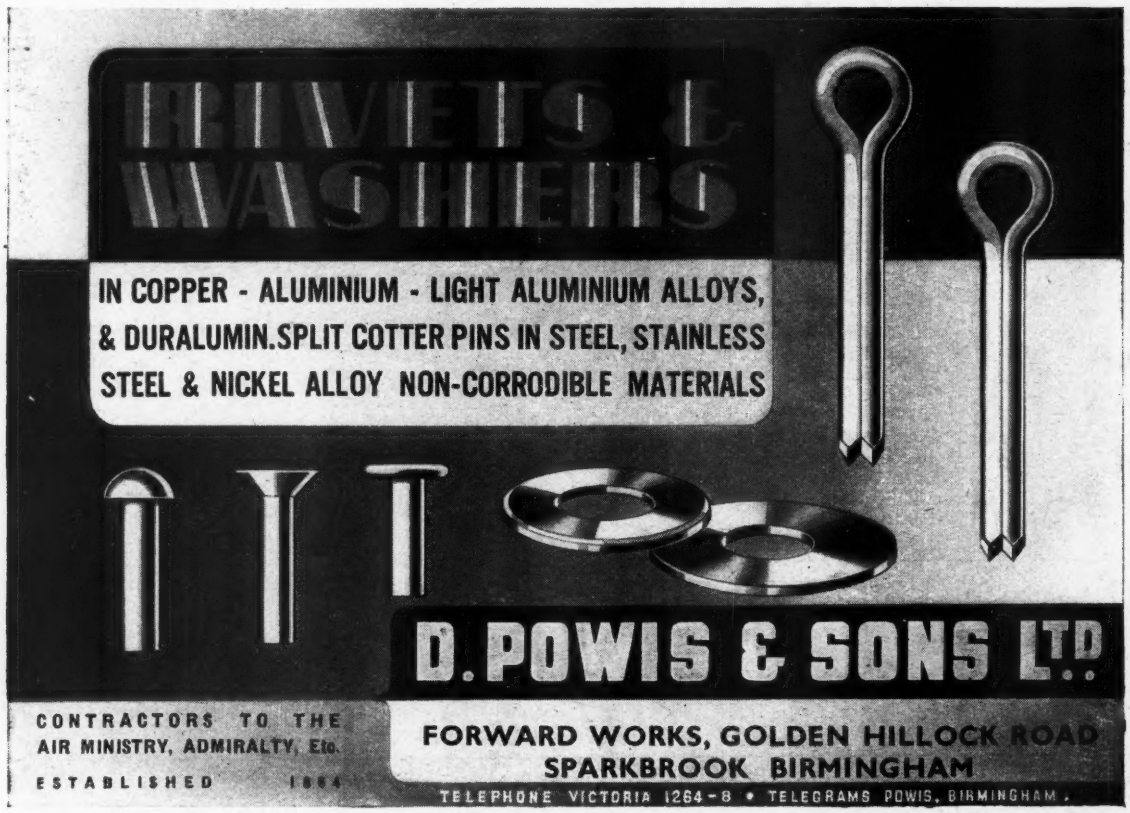
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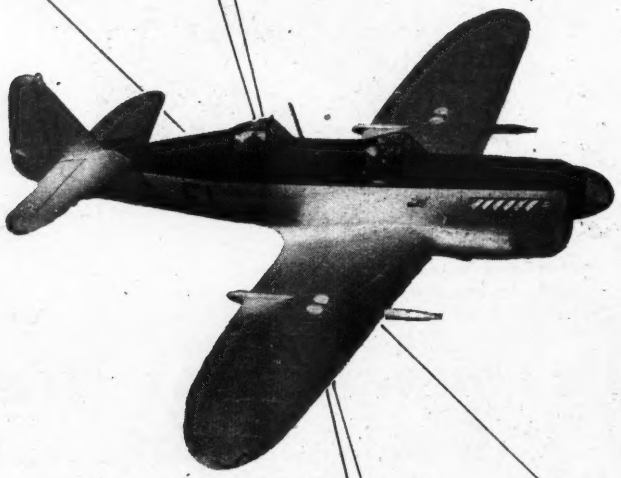

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The Outlook

A Tribute

MEMORIES are notoriously short, and this applies in aviation as in other spheres. Outside the relatively small circle now engaged on helicopter work there are probably few who realize how great is the debt owed to the genius and perseverance of one man, the late Senor Juan de la Cierva. To-morrow marks the 25th anniversary of his first successful flight in an Autogiro, and in this issue we publish a review of the more important stages in the evolution of that type of aircraft, beginning with the C.1 and culminating in the jump-start C.30.

That Cierva should have come to this country for assistance, after the first beginnings in his native Spain, is a matter on which we can congratulate ourselves, and for which we can in a large measure thank the fortunate circumstance that during a period of the first world war he shared with one Mr. Reginald Blake the hospitality of a German prison camp. Cierva taught Blake Spanish, and Blake did his best to teach Cierva English. Which was the more successful we do not know, but we recall that when his first lecture to the R.Ae.S. was read in English by Sir Sefton Brancker, Cierva spoke in French. By the time the next lecture was given, he was able to deliver it in person and in English.

A cruel fate decreed that Cierva should not be spared to see his invention come to full fruition, but we remember very clearly that when he called on us at the *Flight* offices, a few days before he met his untimely end in an airline accident just outside Croydon Airport, he said that the theory of the Autogiro was fully established, and that others could now carry on quite confidently.

That was after the jump-start Autogiro had been demonstrated, and when it looked as if, with just a little more development, it might have given us a very large proportion of the advantages of the helicopter, without most of the helicopter's complications. The work was transferred, after Cierva's death, to G. and J. Weir's Glasgow works where, with Mr. Pullin in charge, began the design of various helicopters. Two or three were built, but the war stopped the work which has since, however, been resumed by the Cierva Autogiro Company at Southampton Airport, where the three-rotor "Air Horse" is now being produced.

The helicopter appears to have supplanted the Autogiro entirely in the almost feverish activity of modern times. Many of Cierva's former collaborators are engaged on the work, and they are building on the foundations so ably laid by that great Spanish gentleman, Juan de la Cierva, whose memory we honour this week.

Going All-American

UNFORTUNATE is a somewhat mild expression when employed to describe the recent announcement that Aer Lingus has decided to sell its Vikings. Just how it came about we do not profess to know, but the story got around that the Vikings were being sold because they were "uneconomical." The official statement, a copy of which we received, contains no mention, nor even a hint, that this was the reason for the decision. It appears much more likely that Aer Lingus came to the conclusion that the Vikings are a much more saleable article than the numerous D.C.3s which the company owns. The export figures which we published in our issue of December 25th indicated a very healthy overseas market for the Viking, and we are not aware that the operators in these different countries have found the Viking "uneconomical."

The sale of the Vikings will leave Aer Lingus with ten D.C.3s and five Constellations. Possibly more of the latter will have to be bought in order to cope both with the Eire-England runs and with the new route to America which it is expected to open next March. It might be argued that choice of aircraft is Eire's business

alone, but it should be remembered that two of the English Corporations are very directly interested, and through them the English taxpayer. It is thus curious, to say the least, that apparently they were not consulted before the announcement was made of the decision to sell the Vikings. The whole matter seems to need ventilation if impressions which may be quite wrong are to be avoided.

In the first report and statement of accounts of the British European Airways Corporation, published recently, there was a paragraph which called attention to the provision in the Civil Aviation Act by which the Minister of Civil Aviation may, with the approval of the Treasury, make grants to any associate of the Corporations. "It appears to us," the report states, "that it would be appropriate for the B.E.A. share of the Aer Lingus losses to be dealt with under this section, and that B.E.A. should be relieved of the necessity of making provision for such losses in its accounts."

An Anomalous Situation

IT may be recalled that in April, 1946 (before B.E.A.C. was formed), the British Government entered into an agreement with the Government of Eire whereby scheduled air services between Eire and the United Kingdom were handed over to the Irish national company, Aer Lingus Teoranta. There was nothing very remarkable in that, it might be argued. Granted, but what is remarkable is that although the Government of Eire owns 60 per cent of the shares in Aer Lingus, B.E.A.C. holds 30 and B.O.A.C. ten per cent. Thus the two British Corporations are made to share in any losses incurred by the Irish company, without having any real control over the running of the line.

At the time the B.E.A.C. report was issued, that corporation's share of the Aer Lingus losses had not been finally ascertained, but it was estimated at £50,000. It is to be hoped that when the board meeting is held in Dublin in a few days, the representatives of B.E.A.C. and B.O.A.C. will elicit full details. Moreover, it would appear timely for the Ministry of Civil Aviation, and indeed for the Cabinet, to review the whole position.

By the time this issue of *Flight* reaches our readers, the report and balance sheet of the British Overseas Airways Corporation will have been issued, and it is likely to paint a fairly grim picture. Nationalized air transport is likely to prove to have cost the British taxpayer more than £10 million, and a thorough examination of the whole system appears inevitable.

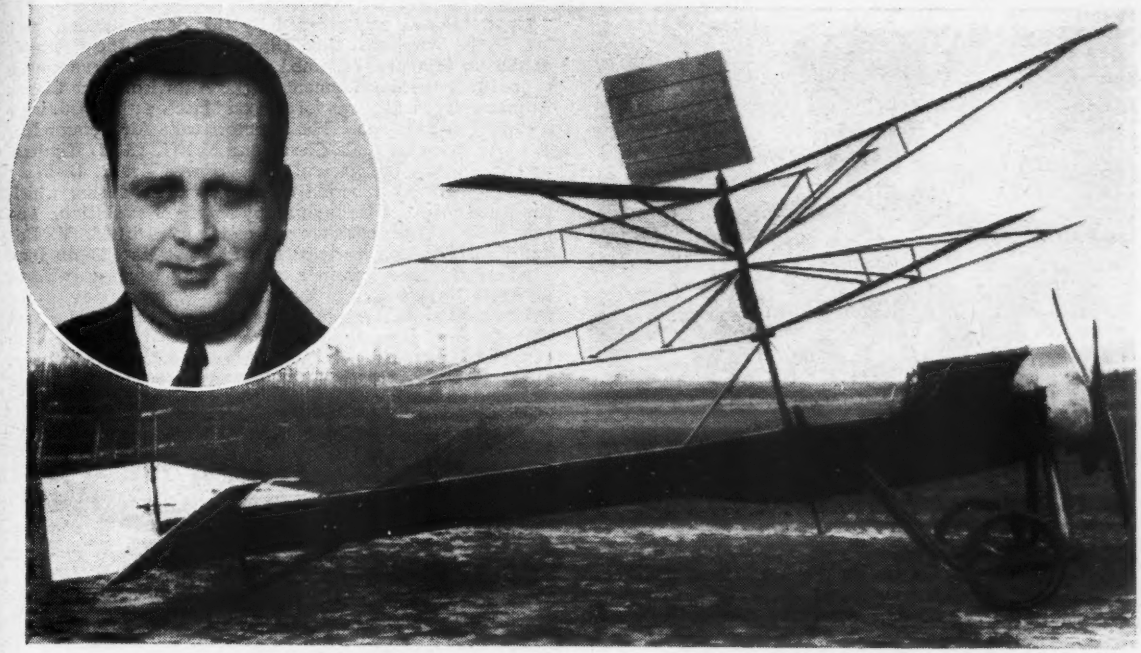
In all this, and before committing ourselves to drastic changes, it is well to bear in mind that American airline operators have also suffered heavy losses, in spite of their alleged superiority.

CONTENTS

Outlook	25
In Memory of a Pioneer	27
Here and There	30
Latest Bristol Piston Engines	32
High-speed Research	34
Slingsby Sailplanes	38
Air Work	39
Upturned Leonides	43
Servo Control	44
New Year Honours	45
Civil Aviation News	46
Correspondence	50
Service Aviation	51

Forthcoming Events, page 37

APRON RIVULETS: A B.E.A. freighter Dakota and a B.S.A.A. York on the tarmac at Lisbon, after a heavy rainstorm. The airport has modern buildings for passenger and freight handling and is one of the best equipped airports in Europe. B.E.A. runs a Viking passenger service between the U.K. and Lisbon three times a week.



THE FIRST AUTOGIRO: The C.1 had superimposed contra-rotating rigid rotors. (Inset) The late Senor Juan de la Cierva.

In Memory of a Pioneer

Cierva's Work on Rotating-wing Aircraft

TOMORROW, January 9th, is the 25th anniversary of the first successful flight made by Senor Juan de la Cierva in the type of aircraft which later became familiar as the Autogiro. It is thus fitting that we should pay a tribute to the man who laid the foundations for all subsequent rotary-wing development, including the modern helicopter, and whose perseverance, in spite of all obstacles, led him so far along the road to complete success before his untimely death in an airline accident near Croydon in December, 1936. His remains, after interment in England, were flown to his native Spain in October, 1946.

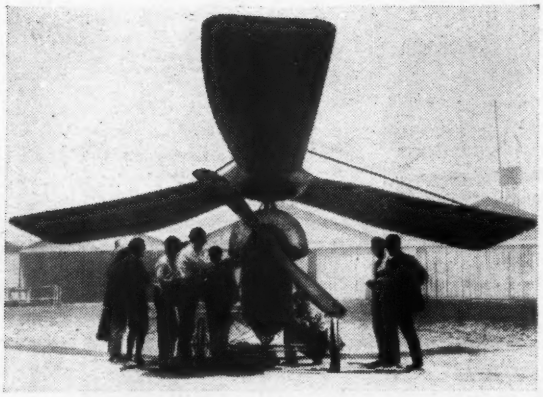
Juan de la Cierva was interested in flying from childhood. The many crashes due to stalling soon led him to thoughts of other means of obtaining lift, and the rotor was the result.

The first machine had two superimposed contra-rotating rotors, but it was found that there was too much interference between them, and Cierva turned his attention to the single-rotor Autogiro. The second machine had a three-bladed rotor with rigid blades (the idea of the "flapping hinge" did not occur to him until early 1922). As in the first and all subsequent machines, the rotor autorotated and was not driven by the engine. It was found that although lift could be obtained the rigid rotor blades tilted the machine to the right. In the C.3 Cierva used a five-bladed rotor, and the elevator was designed for its two halves to work independently and in opposite directions so as to counteract the tilting tendency. This scheme was not, however, a complete success.

Articulated Rotor

As already mentioned, the idea of hinged blades was conceived in 1922, and the C.4 had this feature incorporated in its four-bladed rotor. It was found, however, that the force required by the pilot to counteract the tilting tendency was too great, and in the C.5 (a three-

The final stage. A C.30 making a jump start straight off the ground.



In the C.2 the rigid rotor blades tilted the machine to the right as soon as it became airborne.

In Memory of a Pioneer . . . . .

blader) the hinged rotor blades were rotated in a direction opposite to that of the tractor airscrew. This was found to be a great improvement and the system was incorporated in all subsesquent Autogiros, but ailerons were used for lateral control.

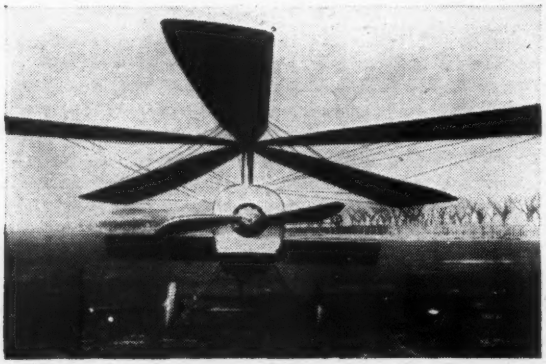
By now, Senor de la Cierva had convinced the Spanish authorities of the practical nature of his invention, and the C.6 was built at the expense of the Spanish Government.

In 1925 Cierva brought to this country an Autogiro very similar to the C.6, and it was given its first public demonstration over Laffan's Plain, Farnborough, in October, 1925. The pilot was Capt. Frank Courtney, who did much of the earlier work as test pilot until he was succeeded by Capt. Rawson.

First Appearance in England

This first Autogiro to be seen in England had a standard Avro 504 fuselage surmounted by a pylon which carried the four-bladed rotor. A single spar, corresponding to the spar of the lower wing of the 504, carried ailerons for lateral control. The normal tail surfaces were retained.

Rotor-starting was, and remained for several years, one of the drawbacks. A cable was wound round pegs on the blades, and several men got hold of the end of the cable; running it out at a sign from the pilot. The rotor speed that could be attained in this way was too low to lift the machine, and Courtney had to taxi around the airfield until the rotor had gained sufficient speed. Once in the air, however, the machine flew at some 65 m.p.h. and landed at about 15 m.p.h.

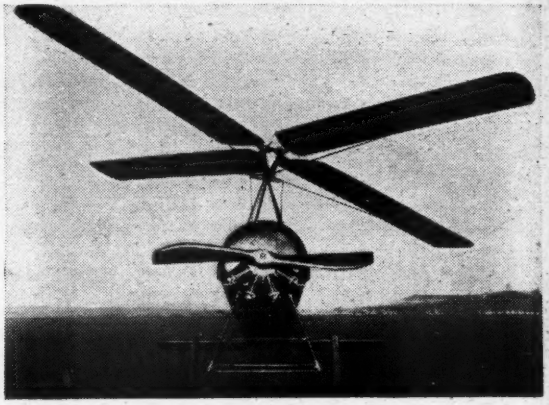


The C.3 had a five-bladed rigid rotor. Lateral tilting was partly checked by a split elevator.

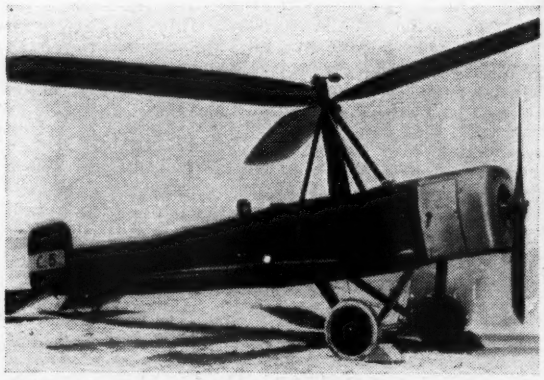
Great interest was aroused by this demonstration, and Mr. H. E. Wimperis, then Director of Scientific Research at the Air Ministry, obtained sanction to give Government support for the development of the Autogiro. The Cierva Autogiro Co., Ltd., was formed on March 24th, 1926, with a capital of £125,000. The directors were Air Commodore J. G. Weir, Senor de la Cierva and Mr. H. K. M. Kindersley. Secretary and general manager was Mr. R. Blake.

Then followed a period of development, during which the Autogiro went through many stages of evolution. The first British-built machine was constructed by A. V. Roe and Co., Ltd., and made its first flight at Hamble on June 22nd, 1926. It was similar to that demonstrated at Farnborough, but had a 130 h.p. Clerget rotary engine.

Many versions followed, but it can, perhaps, be said that the next important step was achieved with the C.19 type Autogiro, in which the surfaces of a biplane tail were



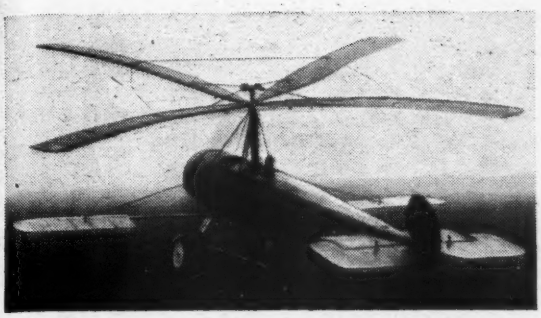
Hinged blades were used first in the C.4 but the pilot's control was too heavy.



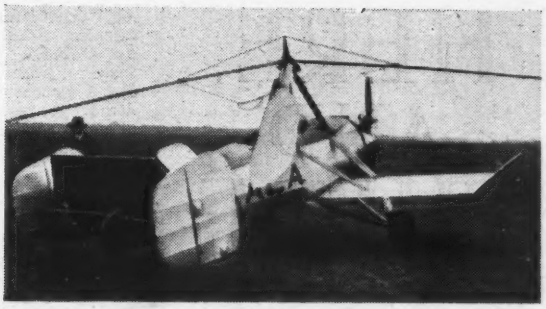
By having the rotor running in opposite sense to the airscrew in the C.5, the tilting tendency was reduced. Ailerons were used for lateral control.

used for deflecting the airscrew slipstream on to the rotor for starting purposes. In that machine also there was a fixed wing instead of the exposed spar which carried the ailerons in the earlier machines.

The next step was the complete suppression of the wing and ailerons, control being by tilting of the rotor head itself. This feature was incorporated in the C.30 and resulted in a very much cleaner design, with accompanying improvement in performance. Rotor-starting by transmission from the engine was another great improvement, and then came the final stage: the jump-start Autogiro. This incorporated what was termed the "autodynamic" rotor head. The earlier model had the beginnings of it in



First demonstration in England in 1925 was given by Capt. Frank Courtney on a machine almost identical with the C.6. The rotor has been started by hand and Courtney is beginning to taxi.



A step forward was represented in the C.19 by a tilting tailplane which deflected the slipstream from the airscrew, thus starting the rotor. Previously it had been necessary to start it by hand.

that there was mechanical transmission from the engine, but in the "autodynamic" the rotor could be speeded up to higher revolutions than were needed in steady flight.

The result was that there was an excess of lift when the rotor blades were changed from zero pitch to autorotative pitch. This was accomplished very simply. The drag hinges were sloped slightly, with their upper ends pointing outwards at a small angle. While the rotor was being "revved-up," the blades lagged behind, and as their hinges were sloped the blades assumed an angle corresponding to zero lift. When the blades began to overrun the engine, the angle increased and the machine lifted, vertically at first and then gradually took up a slanting climbing path.

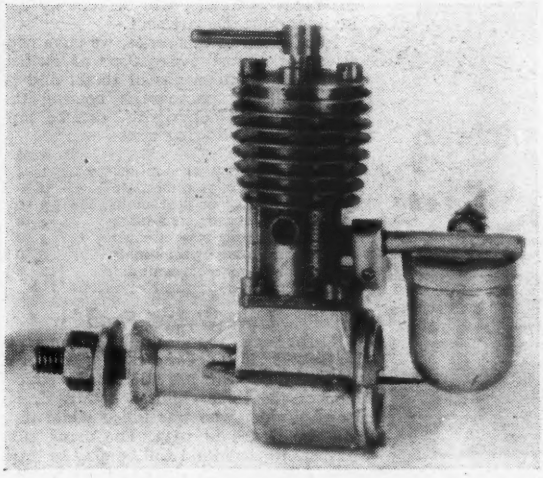
It was not really quite as simple as that, since provision had to be made for the possibility that the engine might falter for a few seconds, but that was the general principle.

With the jump-start Autogiro Senor de la Cierva had gone a long way towards the helicopter ideal. The machine could leave the ground without any run at all, but it did, of course, need some space for its rather flat angle of climb, and for landing approach, although the actual run on the ground after touch-down was a matter of a few feet only. There are many, and we count ourselves among them, who regret that the Autogiro principle was abandoned after it had been developed so far. The simplicity compared with the helicopter was very attractive, and the jump start did enable the machine to do nearly all that the helicopter can do. It is not always necessary to be able to rise and descend vertically, and it seems to us that there is room for the Autogiro as well as for the helicopter.

We would conclude this brief tribute to a great Spanish gentleman who spent so much of his aeronautical life in this country with a reminder that the Helicopter Association of Great Britain offers a prize for the best Cierva Memorial Prize Essay, which is open to all nationalities. The closing date is March 31st, 1947.

A 0.8 c.c. ENGINE

A MINIATURE diesel engine for model aircraft which has a capacity of only 0.8 c.c. has been produced by a French firm. This little engine, which is called the Micron, has a bore and stroke of 10 mm, weighs 42 grammes and is 55 mm high overall. The fuel is a mixture of 75 per cent ether and 25 per cent lubricating oil; with a 22-cm airscrew it runs up to 5,000 r.p.m., and although the mixture adjustment is rather critical the engine starts quite easily. Of the ordinary three-port type with crankcase compression, it runs equally well in either clockwise or anticlockwise directions. The makers are Moteurs Auto-Allumage Micron, 8 Rue Victor Gelez, Paris, XI.



The Auto-Allumage Micron engine. Its height is equal to the length of a matchbox.

JETS IN CANADA

THERE is good news from Canada of turbo jet development and of progress with the C-102 jet-propelled civil transport. Our contemporary *Canadian Aviation* reports that the C-102, which is being built at the A. V. Roe (Canada) factory at Malton, Ontario, will be powered by four Rolls-Royce Derwent Vs, and not, as originally intended, two units of a later and more powerful type. It seems probable that the Derwents will be paired in two oval-section nacelles. The prototype of the C-102 is expected to fly this year and in appearance will be a fairly conventional low-wing monoplane with a single fin and rudder. Designed for 40 passengers the machine will be capable of 400 m.p.h. and will have a range of about 1,200 miles. Pressurization and air conditioning will, needless to state, be standard.

Concerning the Chinook turbo jet (2,300 lb thrust) likewise under development at Malton, it is stated that the prototype should be running during February or March. Data obtained from the trials of the Chinook will be used in the development of a much more powerful unit, the design of which is already in hand.

In essentials the C-102 will be comparable with the Fokker Phantom (two Nene) announced in Paris during 1946.

ASSOCIATED ILIFFE TECHNICAL BOOKS

"FLIGHT" HANDBOOK 4th edition 7s. 6d. (By post 7s. 10d.)

GAS TURBINES AND JET PROPULSION FOR AIRCRAFT by G. Geoffrey Smith, M.B.E., 4th edition, 3rd impression 12s. 6d. (By post 13s.)

WALL DIAGRAMS: Rolls-Royce Derwent, De Havilland Goblin II, Metrovick F/3 Gas Turbine 4s. each. (By post 4s. 4d. each)

TURBINES FOR AIRCRAFT (4-page colour leaflet reprinted from "Flight") 6d. (By post 7½d.)

HANDBOOK OF INDUSTRIAL ELECTRO PLATING. E. A. Ollard, A.R.C.S., F.R.I.C. F.I.M., and E. B. Smith 15s. (By post 15s. 8d.)

From all leading booksellers or from Iliffe and Sons Ltd., Dorset House, Stamford Street, London, S.E.1.

HERE AND THERE

ARCTIC FIGHTERS: Lockheed P-80s of the U.S.A.F.'s 94th Squadron, which has been equipped for Arctic operations, demonstrate some neat station-keeping.

Bristol Gift to Malcolm Clubs

TO assist in setting up the permanent organization in the U.K. of the R.A.F. Malcolm Clubs, the directors of the Bristol Aeroplane Co. are to present to the clubs the company's club and hostel buildings, stores, sports ground and adjoining land at Yatesbury airfield, near Calne, Wilts. It is expected that the actual transfer of this generous gift will take place shortly.

780 m.p.h. Flight Claimed for P-80

IT is claimed by the U.S. Air Force that a Lockheed P-80 Shooting Star flew 175 miles from Misawa to Sendai on January 2nd at an average ground speed of 780 m.p.h., assisted by a strong following wind. No details are given of the method of timing and the altitudes at which times were taken. The speed claimed is 157 m.p.h. faster than the official world record set up in June.

Trans-Canada Airlines

Trans-Canada Airlines are developing their traffic office at Prestwick, so that passengers and agents in Scotland can book there without having to apply to London for reservations on the Prestwick-Montreal service. Mr. D. Bryce-Buchanan is now Scottish traffic and sales representative.

Cook's Tours by Air

THOMAS COOK'S travel agency has organized a number of air tours to countries and islands in the sterling area, including Malta, Gibraltar, Cyprus, the Channel Islands, East Africa and the West Indies. On January 1st thrice-weekly departures on 15-day tours to Bermuda, Jamaica and the Bahamas, with extensive sight-seeing trips, were initiated. The all-in cost of these tours, including hotel accommodation and sight-seeing, is £245 for Bermuda, £258 15s for Nassau and £275 for Jamaica. More ambitious are the air tours to East Africa. Two of them will be of 30 days' duration and cost £460. After arriving at Nairobi on the third day extensive tours by road are made. There is a shorter tour in East Africa, lasting 15 days and costing £280.

Oriental Mosquitoes

ABOUT 150 surplus Canadian Mosquito fighter-bombers have been purchased by the Chinese Government at a cost of between ten and twelve million dollars. They will be brought from the airfields where they are stored to the de Havilland Aircraft plant at Toronto. Here they will be prepared for flight. It is reported also that 150 troop-carrying Curtiss C-46 Commandos have been purchased from the U.S. Assets Administration, and that negotiations over 600 new engines and spare parts are proceeding. American overhaul firms who recondition the machines are expected to provide ferry pilots for deliveries. The price is said to be $5,000 per aircraft.

OPERATION KANGAROO: A crashed Consul was brought back from Spain after dismantling by this Airwork Bristol Freighter, acting for Lloyd's underwriters. It is here shown after arriving at Langley, where reconstruction and overhaul will be carried out.

"Flight" Photographs

TO our special series of postcard-sized photographs of aircraft of the R.N.A.S., R.F.C., R.A.F. and Naval Air Arm, we have now added the following types:—

Blackburn S.28/43.
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Hawker Sea Fury.
Percival Prentice.
Saunders-Roe SR/A1.
Vickers - Armstrongs (Supermarine) Attacker.
Vickers-Armstrongs (Supermarine) Seafire.
Westland Wyvern.

One view only of each aircraft is available, the price being 8d each or 7½d when a dozen or more are ordered. On receipt of 8d a sample card with complete list of the types available, will be sent by our Photographic Department.

In addition to this series, we have negatives of almost every type of British aircraft. Photographs of these, and of any published photograph bearing the words "*Flight* copyright," can be supplied in the following sizes:—

	s	d
Postcard, glossy or semi-matt ..	1	4
6×4in, glossy or semi-matt	2	0
8×6in, glossy or semi-matt	3	0
10×8in, glossy or semi-matt	4	0
12×10in, glossy or semi-matt	5	0
15×12in, glossy or semi-matt	8	6
20×16in, glossy or semi-matt ..	11	6
Hand-coloured prints, size 12×10	1½gs.	

Lowe-Wylde Fund

IN 1935 we announced the formation by Mr. E. C. Gordon England of a memorial fund to provide for the education of the three children of Mr. C. H. Lowe-Wylde, who was killed while testing the Drone in 1933. The many subscribers to that fund will be glad to learn that with the help given in reducing fees by St. Elizabeth's House School and Salesian College the fund was successful in its object. John Lowe-Wylde is now

in the R.A.F.; Constance is married to an American; and Dorothy is in the Land Army. Lord Sempill, Air Commodore Sir Adrian Chamier and the late Kathleen, Countess of Drogheda, were trustees.

A Fatiguing Business

A RIG for fatigue-testing airscrew blades has been developed by de Havilland vibration engineers. Resembling an oversize two-blade airscrew hub, the rig is capable of imposing loads and vibrations whereby permissible stress levels can be determined and has the very valuable quality that it makes possible the obtaining of information from stationary blades which, in the past, has needed a rotating airscrew. Thus the complications of power-plant, space, noise, and inaccessibility during test are swept away by this new departure.

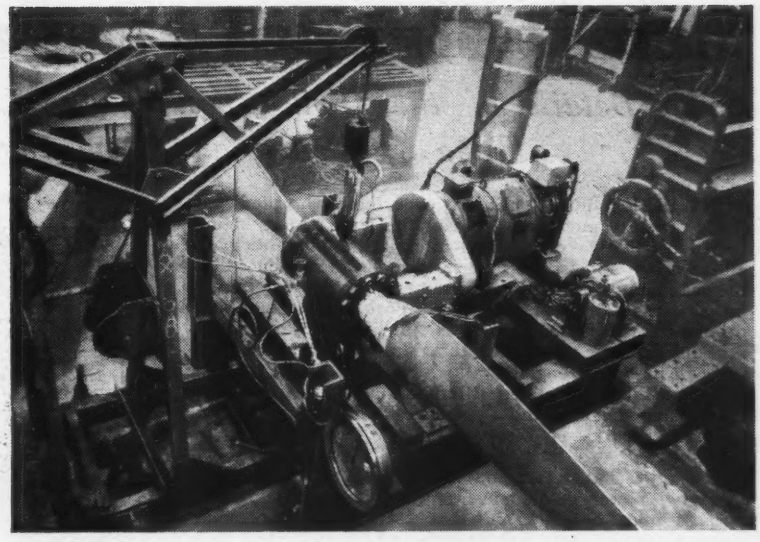
Needless to say, the various orders of vibration are synthetized by artificial excitation, but the effect of centrifugal loads is produced in the hub by an internal hydraulic pressure of 6,000 lb/sq in.

Flying in New Guinea

THE Bristol Freighter which has been used by Qantas to supply the Bulolo goldfield in New Guinea has completed its tour of duty. It was flying-in machinery from Lae, and the normal load was 250 gallons of petrol and about 8,500 lb of freight; trips were also made to Hagen, which required precise navigation, being 5,500 feet above sea-level and surrounded by 15,000-ft peaks. Flying in New Guinea is hampered by turbulent clouds which build up in the afternoon, and by heavy rain at night.

Blackburn Subsidiary

A SUBSIDIARY company, Blackburn (Dumbarton), Ltd., has been formed by Blackburn Aircraft, Ltd., to take over the ownership and operation of the Clyde factory and other Scottish interests of the parent company, and in consequence all purchase orders issued by the Clyde factory have been taken over by the subsidiary, which will make payment. The present company continues to fulfil all obligations incurred under any orders issued in its name. Although the Dumbarton company has a small issued capital, its business will be financed by loans from the parent organization.



DYNAMIC TEST AT REST: *The new D.H. test rig on which dynamic strains can be measured on stationary blades.*

News in Brief

Mr. Philemon R. Dickinson has become assistant to the regional director for the United Kingdom in Europe of Pan American World Airways.

* * *

At the inquest on December 30th on three technicians killed by an explosion at Westcott, near Aylesbury, in November during tests of a German rocket motor, it was suggested by the engineer in charge at the experimental station that there might have been a leak from a pipe split by vibration. The fuel used was petrol, peroxide and permanganate, admitted separately to the combustion chamber of the motor and mixed there.

Air Commodore F. Kirk, O.B.E., who is to represent the Fairey group of companies in Australia.

* * *

The Douglas research aircraft *Flying Swordfish*, built for the U.S. Navy and a sister ship of the *Skystreak*, is ready for first test flights.

* * *

Mr. J. Stanton Robbins, vice-president and European general manager of American Overseas Airlines, has resigned.

* * *

A few days before the Christmas holidays a B.S.A.A. Tudor IV was sent out from London as a special freighter, without passengers, to carry a load of seasonable commodities to Natal and Trinidad.

* * *

As Sola is to be an international airport, the Norwegian government is preparing to move the Norwegian Royal Air Force station at present at Sola to Forus.

* * *

A protest to the Ministry of Works has been made by Brentford and Chiswick Council against the grant of a building licence to B.O.A.C. for £57,000 extensions to their Great West Road premises.

* * *

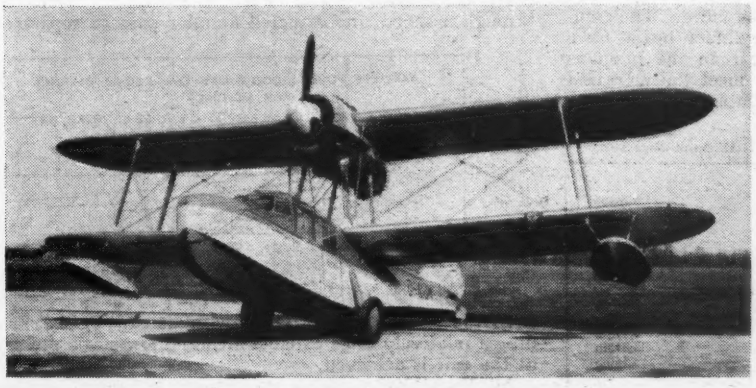
Mr. Neville L. Lupton, M.A., A.R.Ae.S., aeronautical manager of the Sperry Gyroscope Co., Ltd., has been appointed assistant sales manager. Mr. Colin A. Richardson, A.R.Ae.S., M.S.L.A.E., becomes aeronautical manager.

* * *

The "Highways of the Air" exhibition at the Royal Geographical Society's London headquarters is being visited by a number of organized parties from schools and colleges. About 20,000 will visit the exhibition in these parties.

* * *

Mr. R. Kingan, as representative of the British Central Scientific Office in Washington between 1942 and 1945, has been awarded the Medal of Freedom with Bronze Palms, by the government of the U.S.A., for his work in connection with the exchange of chemical warfare information.



SOUTH AMERICAN SURVEY: *This Vickers Sea Otter amphibian has been converted for survey and exploration with the Royal Dutch Shell group in Venezuela. It can take five passengers and a stretcher, for which the hatch has been enlarged. The area under survey is swampy, and Lake Maracaibo will be the base.*

Latest Bristol Piston Engines

Some Details of the Civil Hercules and Centaurus Series : High Take-off Power and Low Consumption

THERE is little doubt that even those who predicted several more years' use for the large piston engine installed in commercial aircraft did not anticipate all the delays and setbacks which have been experienced by the manufacturers of large airframes and the gas turbine power units for them. The fact now is that intensive development of piston engines is still going on and specifications for large passenger aircraft to fly in 1950 and later still call for piston engines.

Two of this country's most important piston engines are the Bristol Hercules and Centaurus, and more details of the latest marks of these units have recently become available.

It is often stated that conditions of operation are such that civil power plants must now be designed for their purpose from the start, and that it is no longer possible successfully to adapt military units. To some extent this is true, but the operative word is *adapt*. If this is taken to mean a substantial redesign of certain components to meet the different requirements of civil operation, there is no reason why the previous experience in military aircraft with other components of the unit should not be of great value. Both Hercules and Centaurus engines were originally designed for military purposes, but the Hercules, and to a limited extent the Centaurus, have proved that they can be operated successfully in freight and passenger transports.

Multiplicity of type numbers still tends to appear confusing at first sight, but the differences in Hercules mark numbers, with a series, for instance between 730 and 759, refer only to the type of airscrew, type of mounting, type of cowling and, in the case of odd or even numbers, whether or not torquemeters are fitted. Reference was made in *Flight* of April 10th last to these numbers and to the addition of 500 to the mark of a military unit when adapted for civil use.

Hercules 730 and 750 Series

The latest civil 14-cylinder, air-cooled Hercules engines the 730 and 750 series, differ from the immediately previous 630 in having several components redesigned to permit an increase in take-off power. The engines are intended primarily for medium-altitude operation and, like the 630, have single-speed superchargers. The redesign is chiefly concerned with stiffening-up of the power section of the engines, but in view of the higher b.m.e.p. used for take-off, cooling problems also had to be faced. The company's new composite copper-based cylinder heads have proved to dissipate heat much better than the previous aluminium heads. The alterations to meet the increased power output have not affected the reliability or the overhaul period of the engines, which normally operate at between 40 and 50 per cent of the take-off output. Moreover, under economical conditions a fuel consumption of 0.415 lb/b.h.p./hr has been achieved.

ENGINE AND POWER PLANT WEIGHTS (Without Airscrew)

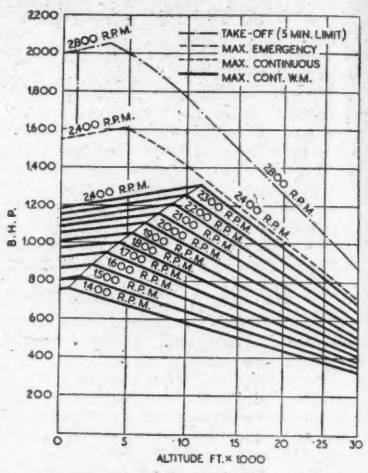
Hercules	
730, 734 engine	2,060lb
732, 738 engine	2,070lb
Torquemeter	35lb
Baffles, screens and exhaust system	175/180lb
730 series power plant with wing entry intake	2,950lb
730 series power plant with external intake scoop	2,930lb
730 series power plant with external intake scoops and free-exit cowling	2,865lb
762 series engine	2,265lb
762 series power plant with wing entry intake	3,195lb
762 series power plant with external intake scoops	3,315lb
760 series power plant with free-exit cowling	3,160lb
Centaurus	
630 engine	2,980lb
Torquemeter	55lb
Baffles, screens and exhaust system	220lb
Typical Centaurus 631 power plant	4,404lb

DETAILS OF EQUIPMENT DISTINGUISHING INDIVIDUAL TYPES

Hercules Mark	Equipment
730, 750	4-point engine mountings
732, 752	6-point engine mountings
734, 754	Free-exit cowl, 4-point mountings.
738, 758	Free-exit cowl, 6-point mountings
760	6-point mountings, 100/130 grade fuel
762	6-point mountings, 115/150 grade fuel

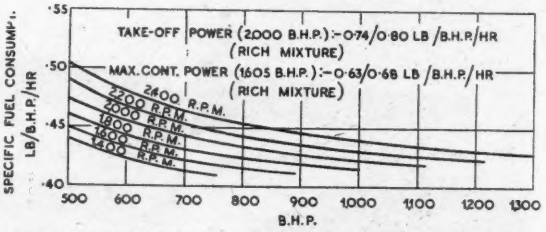
750s and 760s have provision for reversible-pitch airscrews, 730s have not. Addition of 1 to make odd numbers of above indicates fitting of a torque meter.

The 730 and 750 series units and also the 760s, which are referred to below, are normally supplied as complete power plants of which there are alternative versions according to airframe requirements. For aircraft with high cruising speeds air-intakes in the wing leading edge would normally be used, but in cases where this is not permitted, because of the wing structure, external scoops can be provided on the power plant cowling.



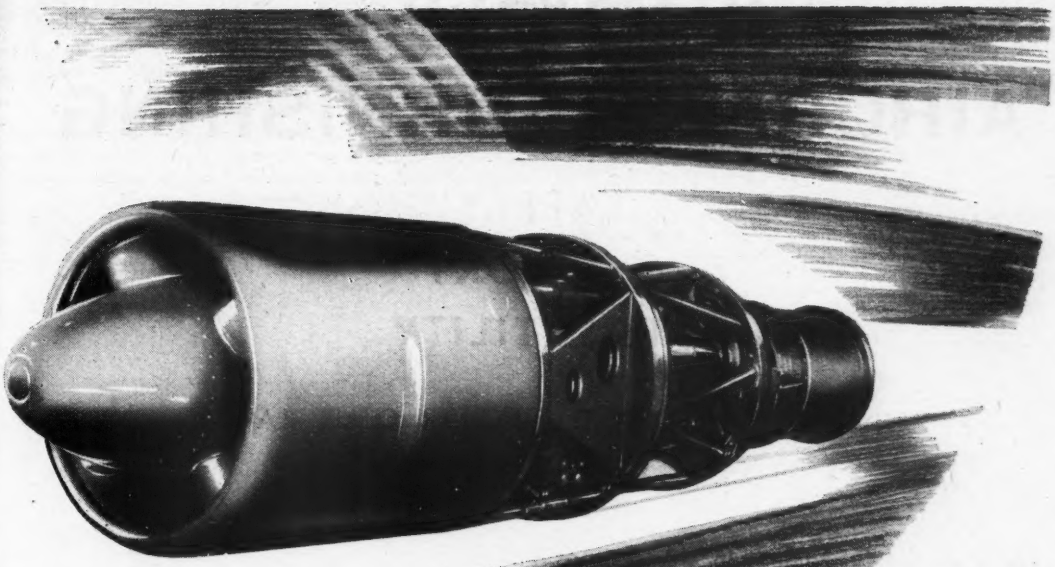
Performance curves for Hercules 730 and 750 series.

For aircraft which may require a high power output from the engines for relatively low forward speeds a third power plant known as the free-exit-cowl type can be provided. In this, controllable air outlet gills are fitted and the air which cools the cylinder heads, about one-seventh of the total flow, is discharged through a short, unobstructed annular passage separately from the main stream. Thus, without causing excessive drag a relatively large exhaust area and low static pressure at the exit is achieved.



Fuel consumption curves for Bristol Hercules 730 and 750 series.

All three power plants incorporate a shutter arrangement which enables the pilot to select either cold air, cold filtered air, or hot air, and provision is made for automatic opening of the warm-air shutter should the cold intake ice up rapidly. In keeping with modern practice, all main



Napier "NAIAD"

PROPELLER TURBINE ENGINE

Total E.H.P. - 1590
Diameter - - 28 inches.
Weight - - - 1095 lbs.

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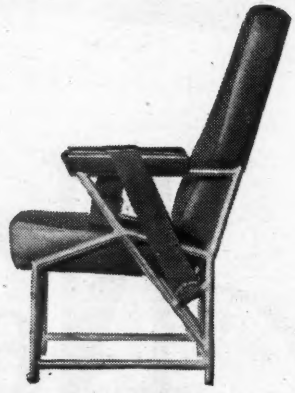
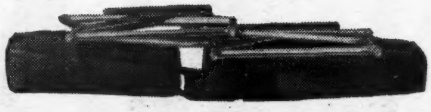


The LAR/140 freighter chair OPEN



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BIC

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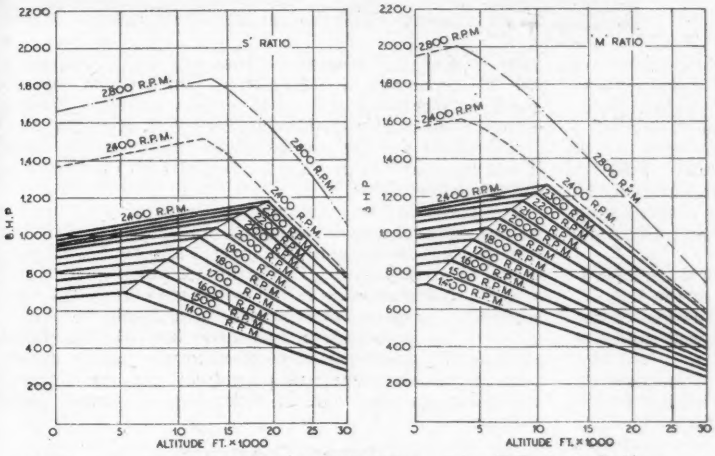
panels hinge, and are fitted with quick-release toggle fasteners and folding support struts.

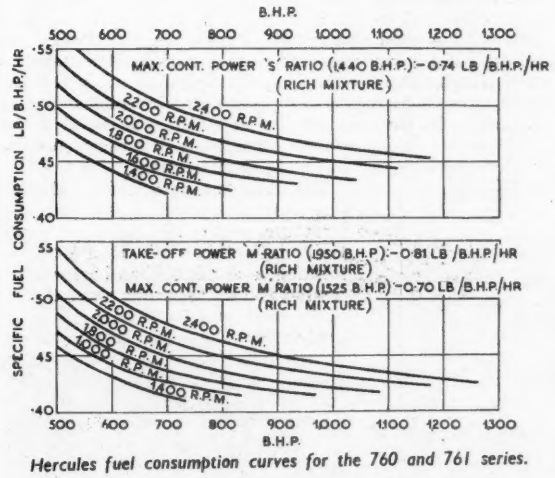
Hercules 760 Series

In common with the engines just described, the Hercules 760s have redesigned power sections which permit an increase of about 20 per cent in the power figure for take-off. Their principal difference is the fitting of two-speed superchargers embodying many of the well-proved design features of those on current military units, but also having certain improvements in mechanical construction. The supercharger drive is of the epicyclic spur-gear type, and the earlier rotating-piston clutches have been replaced with oil-operated pistons of the non-rotating type. As these new clutches are not susceptible to sludging there is no longer need to fit oil centrifuges.

These two-speed engines are intended for aircraft cruising at high altitude, and it was therefore thought wise to modify the auxiliary drive arrangements and to increase the capacity to 150 h.p., thus permitting the inclusion of a cabin supercharger on the auxiliary gear box. Like the 750 series, the 760s also have provision for reversible-pitch braking airscrews. The various numbers in the series indicate the type of fuel on which the unit is rated, and the fitting or otherwise of a torquemeter. All civil Hercules engines are fitted with Hobson-R.A.E. master-control bulk fuel injectors.



Performance curves for Hercules series 760 and 761. Take-off (5 minutes limit) —.—; Max. emergency power —..—; Max. continuous power - - - - - -; Max. continuous power (lean mixture) ———.

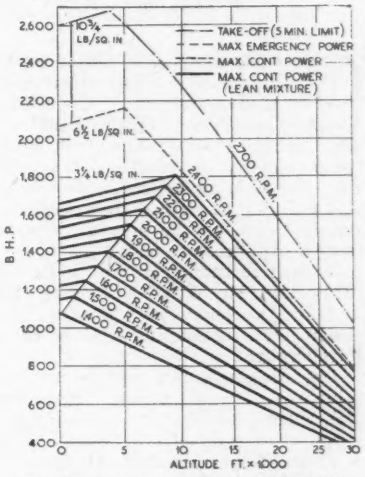

B.H.P.
SPECIFIC FUEL CONSUMPTION LB/B.H.P./HR
MAX. CONT. POWER 'S' RATIO (1440 B.H.P.):-0·74 LB/B.H.P./HR (RICH MIXTURE)
TAKE-OFF POWER M RATIO (1950 B.H.P.):-0·81 LB/B.H.P./HR (RICH MIXTURE)
MAX. CONT. POWER M RATIO (1525 B.H.P.):-0·70 LB/B.H.P./HR (RICH MIXTURE)
2400 R.P.M.
2200 R.P.M.
2000 R.P.M.
1800 R.P.M.
1600 R.P.M.
1400 R.P.M.

Hercules fuel consumption curves for the 760 and 761 series.

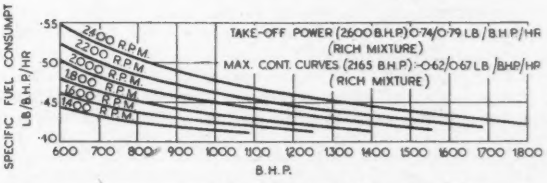
fitted with Hobson-R.A.E. master-control bulk fuel injectors.

Centaurus 630 Series

The first civil Centaurus power plants which embody the Mk. 630 or 631 18-cylinder, air-cooled engine have been prepared for civil aircraft operating at medium altitudes and requiring high take-off power. Differences between these units and the military versions from which they have been developed are chiefly concerned with simplification and ease of servicing. The supercharger is of the single-speed type, and, like the Hercules, the Centaurus has Hobson-R.A.E. fuel injection. This is of a new simplified type with self-contained fuel pump. The distributors and high-tension leads in the ignition system are mounted at the front of the engine where they have cool working conditions and are easily accessible.



Performance curves for the 630 and 631 series of Bristol Centaurus engines.



Fuel consumption curves for the 630 and 631 series of Centaurus engines.

A modification to the reduction gear unit, though not to the gearing itself, makes provision for a reversible-pitch braking airscrew, and the 631, in keeping with the series number system, carries a torquemeter.

In the Centaurus power plant air for the engine intakes and for oil and generator cooling is drawn from inside the cowling. A selector switch in the pilot's cockpit enables him to select either cold air, hot air, or clean air as desired, and the system is protected by valves against a backfire.

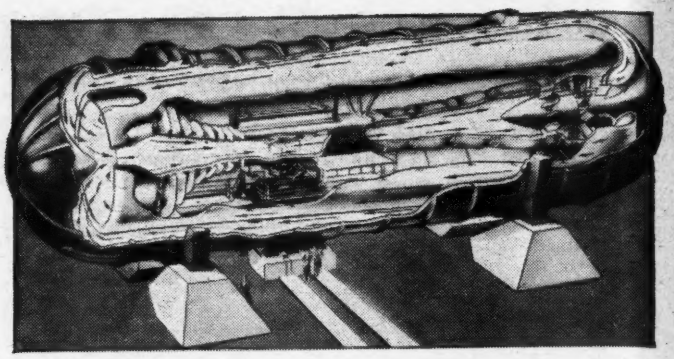
The exhaust pipes are taken to twin collecting manifolds mounted at the rear of the engine and exhausting over the top of the power plant. In addition to their primary function the manifolds aid in silencing the engine.

BOBBING

TWO R.A.F. bob-sleigh teams which left for Switzerland on January 1st took with them sleighs built to a "secret list" design built by an aircraft manufacturer, designed to travel at 80-90 m.p.h. The captain of both teams, one of which will represent Great Britain in the Olympic Games, is G/C. R. W. P. Collings, D.S.O., A.F.C., and the vice-captain is W/C. W. E. Coles, D.S.O., D.F.C., A.F.C. The teams are travelling by jeep, accompanied by the larger of the two sleighs on a trailer.

HIGH-SPEED RESEARCH

The Design and Work of the Large Tunnel at Farnborough



COMPRESSIBILITY effects on the performance and behaviour of high-speed aircraft have been realised for many years, but it was not until 1937 that serious attention was given in this country to the design of a wind tunnel that would enable a study to be made of compressibility on models of reasonable scale. Prior to 1937 a certain amount of work was done at Farnborough and the N.P.L. These tests were made in a small wind tunnel driven on the injector principle by air discharged from a high-pressure reservoir.

In their recent paper, read before the Royal Aeronautical Society, Mr. W. G. A. Perring, director of the R.A.E., and Dr. A. Thom gave a very full explanation of the design, construction and work of the high-speed tunnel at Farnborough.

Towards the end of 1937 sketch plans were prepared for a high-speed tunnel having a single return circuit, but Mr. Relf then suggested that consideration should be given to a tunnel of symmetrical design. It was found that such a design would simplify strength problems, and it was hoped that the distribution of flow in the working section would be better. When the design was completed, it was decided to make a one-sixteenth scale model for tests. Construction of certain parts of the main tunnel was, however, begun before the model tunnel could be finished so as to avoid delays later.

The tunnel was designed to achieve a speed of 600 m.p.h. with an input power of 4,000 h.p., these figures corresponding to a working-section pressure of one-sixth of an atmosphere, absolute. It was realised that the initial rise in temperature would be large, which would have the effect of increasing the speed of sound in the working section. Since, for compressibility work, it is the Mach Number and not the absolute speed which is important, it was necessary to provide the tunnel with effective cooling arrangements.

The possibility of employing the walls of the tunnel as cooling surfaces was investigated, and it was found that, provided the walls and the inner walls could be maintained at about −5 deg C, the tunnel would operate with a static air temperature in the working section of 15 deg C when the airspeed corresponded to a Mach Number of 0.8 and the input power was 4,000 h.p. In the tunnel as designed, cooling jackets were formed as an integral part of the structure and played an important part in stabilizing the shell against collapsing loads when under vacuum.

Tunnel Construction

In order to achieve reasonably low turbulence in the working section, the rate of expansion of the diffuser nowhere exceeded 7 deg total angle, whilst a contraction ratio of 7 to 1 was provided.

Having settled the general form of tunnel design, the model tunnel was used for testing various items such as flow distribution, cooling, fan design and other features. At a later stage the model was used to investigate a slow-period cyclic disturbance of flow which was found to produce unsteadiness of balance readings in the full-scale tunnel.

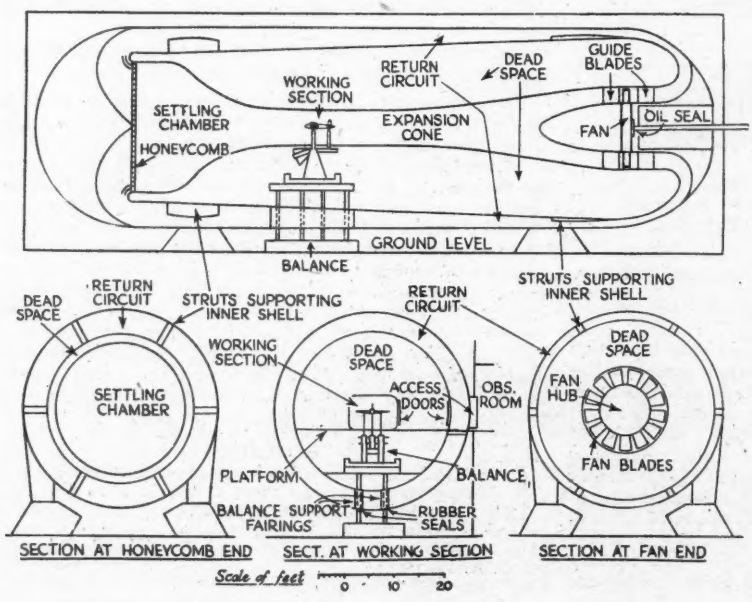


Fig. 1. General arrangement of the High-speed Tunnel at Farnborough.

The main strength shell of the full-size tunnel comprises a cylindrical structure with hemispherical ends. Built into this shell is a structure forming a settling chamber, working section and diffuser cone along the axis of the shell, and an annular return passage around the walls. The outer shell is 37ft dia. by 130ft long and supported on pairs of supports spaced 90ft apart. The inner shell is supported from the outer by two sets of streamlined struts, each set comprising six struts, built in near the ends of the cylindical portion of the outer shell.

The outer shell plates are $\frac{9}{16}$in thick, and the shell was built up in sections 8ft 6in long, each section comprising six plates, complete with their cooling jackets. The walls of the inner structure were of $\frac{3}{8}$in plate, the ends terminating in castings. The working section was also made from castings, all airswept surfaces being machine finished to ensure accuracy and a smooth surface. To protect the surfaces from corrosion they were cleaned and aluminized by metal spraying.

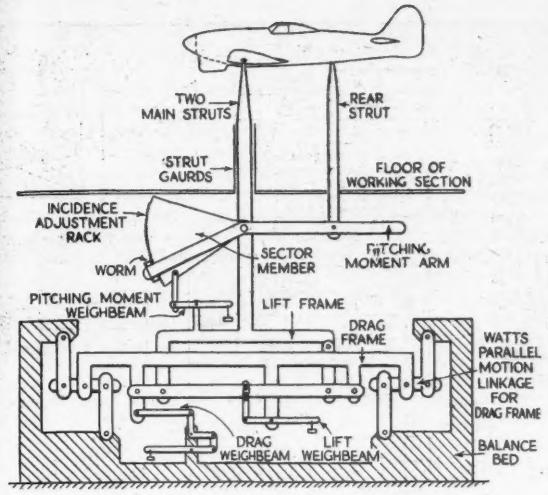


Fig. 2. Principle of lift, drag and pitching-moment balance.

A portion of the working section, measuring 10ft by 7ft, was formed of castings and machined throughout. The tunnel is cooled by circulating brine through the jackets. The air entering the tunnel is dried and cleaned. In spite of this a certain amount of trouble has been experienced from small particles of grit, hair, etc.

One of the most difficult items to design and manufacture was the fan. Originally the fan, which is of 16ft dia., was intended to operate at 960 r.p.m., corresponding to a tip speed of 800 ft/sec, but the fan speed was reduced by ten per cent. Guide vanes were fitted upstream of the fan to introduce pre-rotation into the air. The fan reverses the rotation and leaves a residual rotation which is removed by straighteners at the back of the fan. The 13 blades are light-metal forgings, and each weighs some 320lb. To keep clearance as low as possible the tunnel shell in the vicinity of the fan was machined to be truly circular. The fan is driven by two d.c. motors, each of 2,000 h.p., mounted in tandem. They are supplied by two d.c. generators driven by a synchronous motor on the 6,600 volt a.c. mains. The motors and their control gear were designed to develop full power at speeds ranging from 320 r.p.m to 960 r.p.m. Full power is available over an operating-pressure range of from 4 atm. down to one-seventh atm. without resorting to any pitch-changing of the fan blades.

Pressure in the tunnel can be varied by two compressors, which can also be used as vacuum pumps. Each compressor is of 400 h.p. and they can, when working in parallel, raise the pressure in the tunnel to 4 atm. in 80 minutes, or exhaust it to one-tenth atm. in 45 minutes.

The Balance

The balance and its supports were so schemed-out that it could be adapted to a wide range of work. In the design finally chosen the balance is housed below the working section and consists essentially of a framework so mounted that the vertical and horizontal forces applied to this framework can be measured. On this framework have been installed the balances which measure the remaining four components.

Forces and moments are measured by weighbeams, each with a rider weight on a lead screw, and a series of drop weights by a cam. Since the balance has to be remotely controlled it has been designed to be automatic in operation, motors being provided to drive the lead screw and the drop-weight cam. A selsyn transmitter is coupled to each of the driving motors, which, in turn, operates a dial indicator on a balance panel in the observation room.

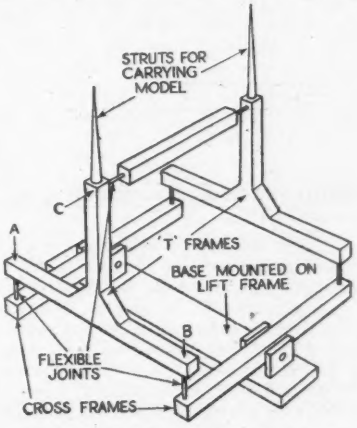


Fig. 3. Principle of roll, yaw and side-force balance.

Details of the balance arrangements are shown in Figs. 2 and 3. Fig. 2 shows the principle of the lift, drag and pitching-moment balance, and Fig. 3 how the roll, yaw and side force are measured. The drag frame is mounted on a Watt's parallel linkage and constrained to move horizontally, while the lift balance is mounted entirely on the drag frame. The pitching moment is transmitted through a parallel outer linkage to a sector member and thence to the pitching-moment weighbeam on the lift frame.

To measure rolling moment, yawing moment and side force (see Fig. 3) each main strut is fixed to a fore and aft member at its lower end. The ends of these horizontal members are connected by cross frames, pivoted on a common fore and aft axis at their mid-points. Two T-frames formed by the vertical and horizontal members are also linked by a horizontal cross-member, and the whole system, which has three degrees of freedom, is restrained by applying measured forces at the points A, B and C. The forces A and B are added together to give rolling moment, whilst their difference measures the yawing moment. C measures the side force.

Airspeed in the tunnel is measured as a pressure difference between two reference holes on a manometric balance in the form of a weighbeam, similar in principle to the main balance weighbeams. To obtain the Mach

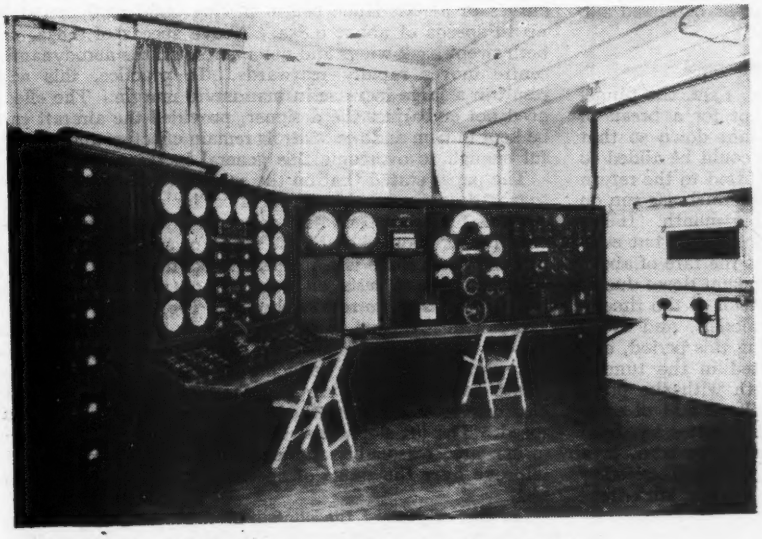
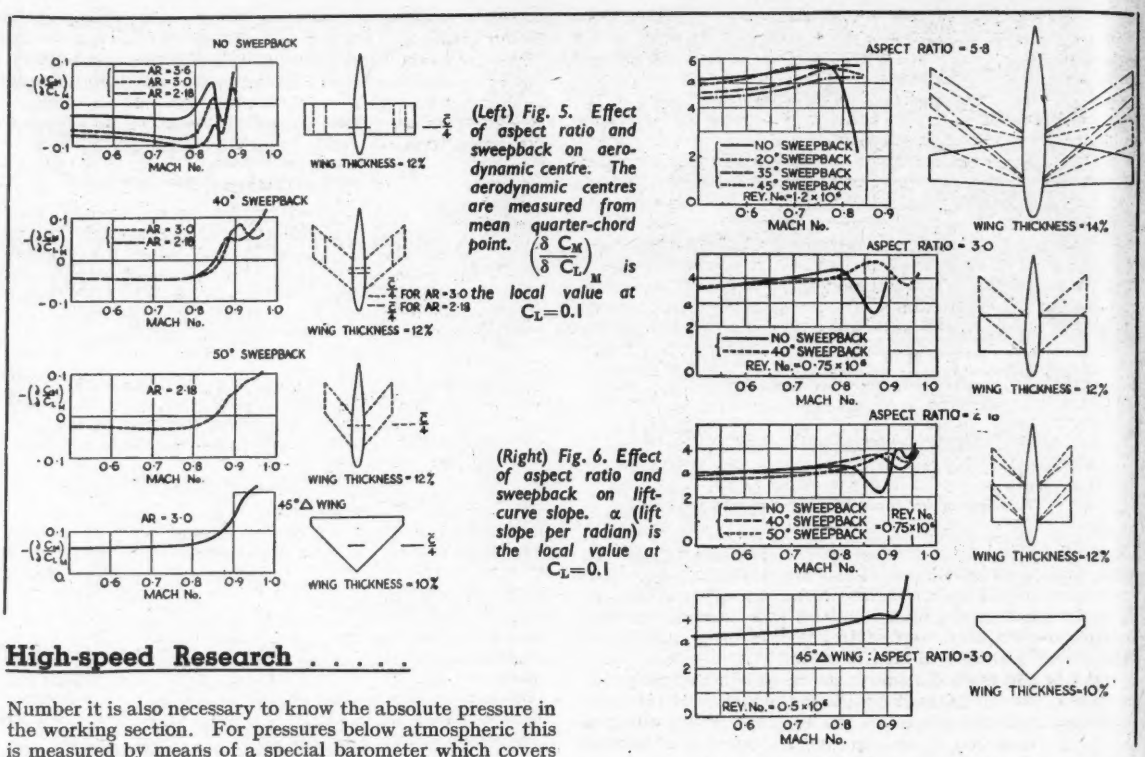


Fig. 4. The control panels in the observation room.



(Left) Fig. 5. Effect of aspect ratio and sweepback on aerodynamic centre. The aerodynamic centres are measured from mean quarter-chord point. $\left(\frac{\delta C_M}{\delta C_L}\right)_M$ *is the local value at* $C_L = 0.1$

(Right) Fig. 6. Effect of aspect ratio and sweepback on lift-curve slope. α (lift slope per radian) is the local value at $C_L = 0.1$

High-speed Research . . . . .

Number it is also necessary to know the absolute pressure in the working section. For pressures below atmospheric this is measured by means of a special barometer which covers a range down to two inches of mercury and can be read to within 0.01in, while for pressure above atmospheric a Bourdon type pressure gauge gives sufficient accuracy. For general work, pressure distribution measurements, or exploration of temperatures, groups of manometer and thermocouple leads have been built into the tunnel, the recording equipment being located in the observation room and permanently connected to distribution boards situated in the dead space.

The next section of the paper dealt in considerable detail with blockage corrections, strut corrections and choking. Further data are required before a detailed analysis of results can be made for the ordinary routine tests on a single aerofoil, but it is obviously desirable that work of this nature should continue, since ultimately it will allow the tunnel to be used well into the regions of mixed sub and supersonic flow.

Work of the Tunnel

Since its official opening in November, 1942, the tunnel has been in continuous operation, except for a break of about a month in 1945, when it was shut down so that the rolling, yawing and side-force units could be added to the main balance and the mixing vanes fitted to the return circuit. During the first three years the tunnel was run on an average between 90 and 100 hours per month. It has since been necessary to run with a reduced staff, but even so the tunnel has continued to operate at the rate of about 30 hours per month. It has never had to shut down due to failure of any part of the plant. For much of the time it has been used for testing complete models, and every important high-speed aircraft built during this period, and many built before then, has been tested in the tunnel.

The paper dealt at considerable length with the problems of research on the effect of sweepback and of compressibility on longitudinal stability. The latter has been studied theoretically by Gates and Miss Lyon who, in a generalized theory have set out four important criteria: the static margin, stick-fixed; the static margin, stick-free; the manœuvre margin, stick-fixed; and the manœuvre margin, stick-free. So far only the stick-fixed margins can be measured in the tunnel. The stick-fixed static margin is proportional to the change in stick position required to trim in steady flight to a higher or lower speed than the initially trimmed speed; the stick-fixed manœuvre margin is proportional to the stick movement per g.

At small angles of incidence and on conventionally shaped wings, the aerodynamic centre tends to move forward as the speed increases. At first the movement is slow, but above Mach Numbers of about 0.75 it can become fairly rapid. Ultimately, as the speed is further increased and becomes supersonic, the aerodynamic centre moves back again and tends towards 0.5 of the chord.

Designers of high-speed aircraft are now particularly interested in the effects of sweepback. Fig. 5 shows some test results. The effect of sweepback is favourable, the curves of aerodynamic centre having good characteristics up to speeds of about 0.85a. Above speeds of 0.85a, on both swept-back wings and delta aerofoils, the aerodynamic centre moves rapidly rearwards. In practice, this will result in a large increase in manœuvre margin. The effect need not embarrass the designer, provided the aircraft can be kept in trim and the controls remain effective and powerful enough to overcome this general increase in stability.

The paper stated that on the subject of controls, further tests had confirmed the results of earlier work, viz., elevon controls on swept-back and delta wing forms ceases to be effective at about 0.93 of the speed of sound, and at still higher speeds there is a reversal in control effectiveness.

During recent tests on aerofoils of various planforms and thicknesses the results shown in Fig. 6 were obtained. The fall in lift slope at Mach Numbers of 0.8 in the case of wings without sweepback is apparent, and it is interesting to observe that reducing the aspect ratio, while it results in reducing the slope of the lift curve at low speed, also results in a less marked collapse in lift slope at high speed. The lift slope of swept-back wings and delta planforms are reasonably maintained, and on the whole improve over the range of speeds it has been possible to test.

On the subject of the contribution to stability made by a tail, the paper pointed out that several factors combine which enable the tail to remain effective at high speed.

The designer has usually made his tailplane thinner than the wing, so that the main wing will tend to stall earlier than the tail. Also, the tailplane is in a region of reduced airspeed, due to the presence of wing and body; the lower speed, while reducing tail effectiveness, also delays the onset of compressibility, thus enabling the tail to remain effective even after the wing has stalled.

The concluding section of the paper dealt with recent work on detail improvements made in the tunnel equipment. The tunnel staff have turned their attention to the development of new techniques, in the hope that it will be possible to extend the usefulness of the tunnel. Two methods have been employed to reduce blockage. One is the reduction in size, or elimination, of the model supports; the other is a reduction in the overall size of the models. By this means, and by re-designing the working-section fillets, it has been possible to test models over a range of Mach Numbers up to 0.94. With a model of 2ft 6in span, supported on a sting instead of on struts, it was possible to attain a Reynolds Number of 0.5×10^6. Originally the method of model support did not allow of drag measurements, but this has now been made possible. The sting is supported by means of links so that it is free to move fore and aft, the movement being restrained by a spring. A design is now in hand to mount the sting support from the main balance. This should improve the rigidity and make it easier to adjust the flow conditions or control the choking in the tunnel. By these methods, and by adjusting the working-section fillets, it is hoped to extend the useful range to speeds of 0.96. By further re-design of the tunnel fillets it will be possible to run the tunnel supersonically, thus approaching the velocity of sound from speeds in excess of M = 1.0. Attention is also being given to the development of the "half-model" technique, which will eliminate interference and the blockage caused by model supports. It will permit larger models to be used, so increasing the Reynolds Number, or for a given size of model it will reduce the blockage caused by the model.

THE AIR LINER THAT "BUNTED"

CONCERNING the incident in America when a pilot locked the elevator and the aircraft subsequently did a "bunt," which was described so graphically by "Kibitzer" in his American Newsletter, we have received a communication from the only English passenger in the machine, Mr. Herbert C. Ryland, a London accountant, who was hurt badly enough to have to be taken to hospital. Mr. Ryland pays a warm tribute to the second pilot, Mr. Mel. Logan (who righted the machine), for his cool head and great skill. His parting words as Mr. Ryland left in a relief aircraft were: "Boy, for the rest of your life you will be living on borrowed time!"

HARMONIZING OLD SPANISH AND MODERN CUSTOMS

IN Mexico, the government and Aeronautical Radio de Mexico S.A., have assisted Lineas Aereas Mexicanas, S.A. (LAMSA), a subsidiary of United Air Lines, to set up a comprehensive system of airport lighting and navigational aids. The installations along the entire North-South system of the airline include revolving beacons and radio range stations, there being beacons at Juarez, Chihuahua, Torreon, Coahuila, La Colorada, Zacatecas and San Luis Potosi and radio ranges at Torreon, Queretaro, San Luis Potosi, La Colorada, Jiminez, Chihuahua and Neuva Casas Grandes. Mazatlan already had radio facilities. All the ranges are of the low-frequency, four-course type operating on 200-400 kc.

Further co-operation is being received from the Church. It is an old custom in parts of the country to take a pot at any attractive target. This includes revolving beacons, naturally, and the Church, besides using its influence on behalf of the beacons, is also wiring the church spire at Torreon to light up with the airport lights.

THE CLEVELAND RACES

FURTHER to our notice in *Flight* (December 4th, 1947) regarding R.A.F. participation at the U.S. National Air Races we now understand that no definite invitation has been extended to the Royal Air Force.

The National Air Races will be held in Cleveland on September 4th, 5th and 6th with qualifying trials on August 31st, September 1st and 2nd, and the hope is that a more than usually attractive meeting will be arranged as the convention of the Federation Aeronautique Internationale is to be held in Cleveland during the preceding week.

The question of R.A.F. fighter participation is, we understand, determinable chiefly as a dollar question. It would mean shipping the aircraft to America and, of course, the consumption of dollars whilst over there. We further understand that if any Fighter Command representation were to be given it would most likely be by the Odiham Vampire squadron. There would, apparently, be little likelihood of entry for any of the races and the presence of a unit of the Royal Air Force at the meeting would, as in the past, be confined purely to a demonstration.

WINTERIZING THE PRENTICE

FULL winterization tests of the Percival Prentice, which has been adopted as the standard basic trainer by the R.A.F., are being carried out at Edmonton, Canada, under the direction of Mr. G. W. Wilson, of the Ministry of Supply. Senior officers of the R.C.A.F. have been following the tests closely, among them A.V-M. Guthrie, A.O.C. of the Canadian North-West Air Command, who recently visited Edmonton with members of his staff and Mr. Malcolm Brown, general manager of Percival Aircraft (Canada), Ltd.

U.S. AIRLINES ECONOMY

AIRLINES in America, flying more aircraft on more routes than ever before, are facing the need for better methods of operation. Unofficial figures show that during the first half of last year operating revenue rose 19 per cent over that of the first half of 1946, but at the same time expenses increased by 31.4 per cent. Since the end of the war the addition of some 350 four-engined and 120 twin-engined aircraft raised the total American commercial fleet to more than 900 and the route mileage flown in the United States has increased from 46,000 before the war to 115,000 at the present time. The airlines are therefore looking for economy on the ground through savings in booking and other administrative expenses.

The "Union Station" type airports, at Cincinnati, Ohio, and Willow Run, near Detroit, are being watched with interest, since they have been converted into terminals capable of serving 20 four-engined aircraft at a time, providing servicing arrangements, fast booking, passenger information and baggage handling facilities. These airports will endeavour to save the airlines about 33 per cent of their previous ground operating costs.

FORTHCOMING EVENTS

Jan. 14th.—Royal United Service Institution: "High Command of the Armed Forces." Air Vice-Marshal E. J. Kingston-McCloughry, C.B.E., D.S.O., D.F.C.

Jan. 15th.—Royal Aeronautical Society: Joint lecture with the Institute of Fuel. "Gas Turbine Accessory Systems." O. N. Lawrence, A.F.R.Ae.S.

Jan. 15th.—R.Ae.S. (Gloucester and Cheltenham): Film on Rocket Flight.

Jan. 16th.—Institute of Navigation: "Grid Navigation and its Allied Problems," S/L. R. H. Blackmore.

Jan. 17th.—Royal Aeronautical Society Reception at No. 4, Hamilton Place.

Jan. 20th.—R.Ae.S. (Bristol). Debate.

Jan. 20th.—R.Ae.S. (Graduates and Students) Helicopter Films. Commentary by Captain Cyril Turner, A.F.C.

Jan. 24th.—Royal Aeronautical Society Reception at No. 4, Hamilton Place

Jan. 24th.—Helicopter Association of Gt. Britain: Lecture by H. M. Yeatman, M.A., A.F.R.Ae.S.

Jan. 28th.—Royal United Service Institution: "Resistance Movements in War." Maj. Gen. Sir Colin Gubbins, K.C.M.G., D.S.O., M.C

Jan. 29th.—R.Ae.S. (Manchester): "Pressurization." G. Beardshall.

Jan. 29th.—R.Ae.S. (Preston): "Photographic Interpretation of Bomber Offensive Against Germany." S/Ldr. G. A. Morris, O.B.E.

Jan. 29th.—Royal Aeronautical Society: "Flight Testing of Helicopters." W. Stewart, B.Sc.

Feb. 3rd.—R.Ae.S. (Belfast): "High-Speed Flight." Dr. Hilton.

Feb. 4th.—R.Ae.S. (Gloucester and Cheltenham): "Air Operations in the Battle of Britain."

Feb. 4th.—R.Ae.S. (Luton): "Some Problems in Civil Aviation." N. E. Rowe, C.B.E., B.Sc., D.I.C., F.R.Ae.S.

Feb. 4th.—R.Ae.S. (Southampton): "Structure Testing." P. B. Walker, M.A., Ph.D., F.R.Ae.S.

Feb. 6th.—Institute of Navigation: "A New System of Compass Correction." Dr. G. N. Harvey, O.B.E.

Feb. 10th.—R.Ae.S. (Graduates and Students): "Stability and Control Problems." D. J. Lyons.

Feb. 12th.—Royal Aeronautical Society: "The Aerodynamics of the Gas Turbine." A. R. Howell.

Feb. 18th.—Royal United Service Institution: "The Strategic Offensive Against Germany." Air Chief Marshal Sir Norman Bottomley, K.C.B., C.I.E., D.S.O., A.F.C.

Feb. 23rd.—R.Ae.S. (Bristol): "Accidents and Their Investigation." Air Commodore Vernon Brown, C.B., O.B.E., M.A., F.R.Ae.S.

Feb. 25th.—Royal United Service Institution: "The Home Fleet in the War." Vice Admiral Sir Patrick Brind, K.C.B., C.B.E.

Feb. 25th.—R.Ae.S. (Graduates and Students): "Suction Aerofoils." B. Thwaites.

Feb. 26th.—Royal Aeronautical Society: "Evolution of the Design of an Aeroplane." Prof. R. L. Lickley, B.Sc., D.I.C., F.R.Ae.S.

Feb. 26th.—R.Ae.S. (Manchester): "Naval Aircraft." Capt. Fancourt, R.N.

SLINGSBY SAILPLANES

Details of Current Range : The Ultra-efficient Gull IV

WITH interest in gliding and soaring increasing weekly, a resumé of the sailplanes now being produced by Slingsby Sailplanes, Ltd., of Kirbymoorside, near York, is topical and valuable. The types range from the familiar Cadet, by way of the Tutor, to the Type 21B and Gull IV.

Kirby Cadet. Intended solely for initial training up to the "C" Certificate stage, the Cadet has been adopted by Reserve Training Command. Over five hundred examples are said to be in circulation, and during its eminently useful career important improvements have been incorporated in the type. Modification and refinement have been facilitated by the ready interchangeability of major components. The Cadet has a wing area of 170 sq ft and a wing loading of 2.81 lb/sq ft. Prices lately announced by the manufacturers are:—

	Ex-works cost (England)	Crated for Export
Cadet (full kit form)	£200 ..	£215 12s od
Cadet (wings made, fuselage kit)	£261 ..	£281 os od
Cadet (completely made up) ..	£325 ..	£352 10s od

Kirby Tutor. A secondary type sailplane developed from the Cadet, the Tutor is a very manœuvrable intermediate type. The improved performance has been achieved by using a higher aspect ratio and a differential mechanism in the aileron control circuit. The designation Tutor II applies to the type as fitted with a parachute box behind the pilot's seat, rendering the machine suitable for towed flight and cross-country work. The makers report that the whole airframe has been proof loaded on their special test frame, designed by the Royal Aircraft Establishment, and that the results disclosed very high reserve factors, particularly in the wing structure. The following prices are current:—

	Ex-works cost (England)	Crated for Export
Tutor (full kit form)	£230 ..	£245 12s od
Tutor (wings made, fuselage kit)	£294 ..	£316 os od
Tutor (complete)	£360 ..	£391 10s od

Slingsby Type 21B. Intended as a simple type of dual-instruction sailplane of medium performance and low cost, the 21B is a strutted high-wing monoplane with side-by-side seating. All controls are duplicated and lift spoilers are fitted to increase the sinking speed for approach and landing and to provide effective glide-path control. Tail trim is optional. The forward portion of the fuselage, including the two main wing attachment frames, is of wooden (ply-covered) stressed-skin construction, but the rear portion is of fabric-covered girder type, with frames suitably placed for the attachment of the tailplane and elevator.

Wooden construction is used for the high wing, with fabric covering from the rear of the main spar to the trailing edge; the wing is of single-spar torsion-resisting nose box type, with a light secondary spar carrying the ailerons and adding to the general rigidity. A single strut braces the wing on each side. The undercarriage consists of a single control skid and a single wheel.

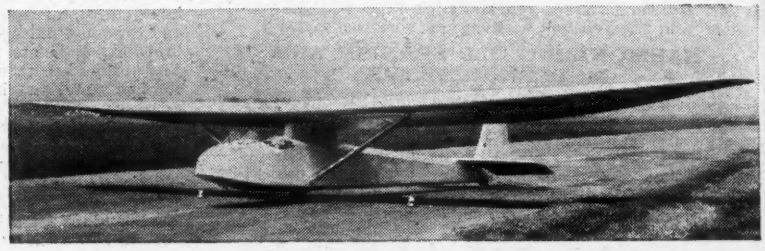
An exceptional field of view is obtainable from the cockpit, which has provision for back-type parachutes. The towing attachment mechanism is of the familiar Ottfur type. Provision is made on the dashboard for A.S.I., Kolsman sensitive altimeter, Cobb-Slater variometer, and Pullen electric turn-and-bank indicator.

The wing area is 260 sq ft and the best gliding angle, at 42 m.p.h., 1 in 22. It is pointed out that the performance over a speed range of 36 to 50 m.p.h. is reasonable, since the gliding angle is above 1 in 18 and the sinking speed below 3.75 ft per sec throughout the whole range.

Though intended primarily for training, the T.21B has obvious possibilities as a joy-riding machine. Being larger and more elaborate than the types previously referred to, the T.21B is relatively expensive, prices being as follows:—

	Ex-works cost (England)	Crated for Export
Type 21B (full kit)	£604 ..	£626 os od
Type 21B (wings made, fuselage kit)	£750 ..	£782 os od (Provisional)
Type 21B (completely made up) ..	£780 ..	£818 os od (Provisional)

Slingsby Gull IV. The latest sailplane in the 15-metre class yet built, the Gull IV, is reported to have handling qualities and a general performance superior to the German Olympia, designed in 1938 by Hans Jacobs, of Darmstadt. A selected test team tried out the Gull IV for comparison with the Olympia, and the following is an extract from the report in which an index figure of 100 was taken for the Olympia: "Longitudinal stability 125; rolling power 110; spin 100; spiral stability 100; cockpit 150." On this showing a claim by the makers that conclusive proof had been provided of the advancement in design in nine years, and of the wisdom of giving full support to British designers, is certainly borne out. By producing machines of 1938 vintage, or even German types, the company might have embarked on a sound commercial policy, but they felt that they could not afford to discourage "the splendid aspirations of our own people, whose superior design ability was demonstrated so conclusively during the war years."



The Slingsby Type 21B, a dual-control sailplane of medium performance, has a span of 54 feet.

Data for the Gull IV are: Span 49ft 10½in; weight empty 467 lb; gliding angle at 40 m.p.h. 1 in 26; sinking speed at 38 m.p.h. 2.3 ft per sec. Completely made the Gull IV costs £625 ex works, and crated for export £651 15s.

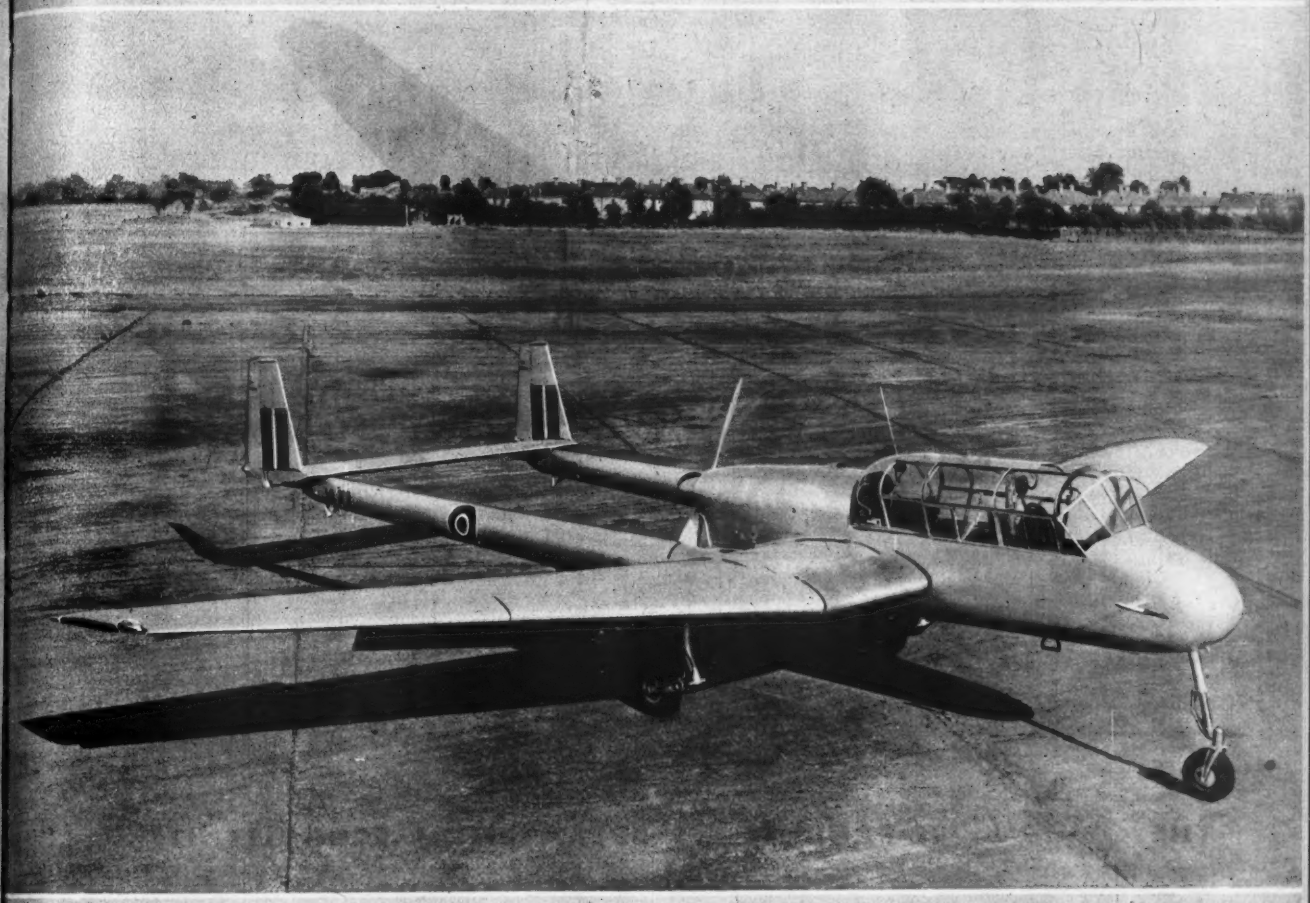
It must be pointed out that the prices quoted above for all types do not include general shipping charges.

"SACRED COW II"

THE temporary grounding of all Douglas DC-6s, including President Truman's personal machine, has already been mentioned. During the early part of this year, however, all machines of the type should once again be airborne and *Independence*, as the President's aircraft is officially known (alias *Sacred Cow II*) will doubtless be active. This machine has a range of 4,480 miles and will seat twenty-five passengers. The main stateroom contains a conference table, convertible bed/divan, telephone, radio and a swivel chair. Special cases allow maps and charts to be unfurled for the President's convenience. The galley is equipped to prepare warm meals and hot and cold drinks.

GIPSY *Proven* RELIABILITY

for the aircraft of to-day



Heston Air O.P., fitted with a Gipsy Queen 33 fan-cooled pusher engine of 240 b.h.p., driving a de Havilland bracket-type, constant-speed, quick-pitch-change propeller.

DE HAVILLAND

GIPSY ENGINES

DH ENGINES

IN SERVICE WITH *British South American Airways*

THE *Tudor IV* IS PROVING ITS OPERATIONAL ECONOMY, ITS

ALL-ROUND PERFORMANCE AND ITS EXCELLENT

RANGE/PAYLOAD CHARACTERISTICS

TUDOR IV

FOUR ROLLS ROYCE MERLIN ENGINES

A. V. ROE & CO. LTD., MANCHESTER (BRANCH OF HAWKER SIDDELEY AIRCRAFT COMPANY LIMITED

ROY PEARL writes about

AIR WORK

The Organization Behind the Many Activities of a Large Private Enterprise

AFTER eighteen years of experience in the maintenance and repair of aircraft, Airwork Limited formed an air transport contract charter division with six Vickers Vikings and a Bristol Freighter. Such an extension of activities indicated the firm's belief that its maintenance organization had reached a stage of development which would permit the introduction of a fleet of medium-heavy aircraft, to be maintained and operated from the firm's resources. It also indicated the firm's belief in British aircraft and in charter flying as an integral part of civil aviation. The result is a complete, general service for aviation.

A suitable yardstick to indicate the size of such an organization is difficult to find, for whereas size in terms of man-power, or industry in terms of man-hours, may convey an accurate impression, the appropriate yardstick would surely be ramifications in terms of commitments. The firm was started when Heston airport was opened by Mr. Nigel Norman and Mr. Alan Muntz eighteen years ago. The airport then provided full Customs facilities, accommodation and maintenance facilities for aircraft belonging to private owners, and a flying school, but it may be said that throughout its subsequent expansion the firm's activities have revolved around the belief in an efficient maintenance organization.

From the beginning of the war to 1944, Airwork were important Blenheim repairers at the Renfrew base; in 1944 the contract changed to Avengers, and the same base continued to repair that type for the next two years. From 1940-1942 Lysanders were repaired at Loughborough, and in 1942 that depot undertook the repair of Bostons until, from 1944, Lancaster components were produced there for a year. In the meantime at Gatwick Wellingtons were repaired and converted, from 1941-1943, and Liberators from 1943-1945, after which attention was turned mainly to Dakotas. Altogether about 2,400 men were employed on war work.

In the pre-war years, then, and from 1939-1946, Airwork was concerned not only with the maintenance of aircraft but also in their conversion from various rôles. At Perth airfield a flying school had been established which in 1939 was replaced by No. 11 E.F.T.S. Airwork continued to operate the school, however, and opened up others at Elmdon and Booker, with schools for air observers at Staverton and Wigtown. During the whole of this time there had developed a sales organization with world-wide contacts.

It can be appreciated that the transition to civil aviation at the end of the war required little reorganization in the Airwork maintenance division, and Gatwick was appointed the principal maintenance establishment. The R.A.F. before the war found it to be more economical to put on a

Looking across at a batch of Dakotas on the tarmac at Gatwick Airport. It will be seen that some have already been decamouflaged, a laborious process, and Airwork Ltd. have stripped of paint about 60 Dakotas since the end of the war. In the upper picture a component is being dismantled for inspection. The chief inspector being approved by the Air Registration Board.

Crowded into one of the hangars can be seen five Dakotas and many ancillary parts. The company carries a large stock of Dakota spares.

AIR WORK . . . .

contract basis the larger overhauls, and even the responsibility for elementary training of pilots, owing to the expense in the upkeep of the aircraft. Similarly the British Airline Corporations have found it more economical to contract-out certain necessary modifications and the larger overhauls.

All the British European Airways Corporation's Dakotas are sent to Gatwick for the periodical C. of A., and if necessary for conversion to the Corporation's own specifications for passenger or freight-carrying aircraft. The same applies to B.O.A.C. Dakotas and those accepted for the Ministry of Supply for distribution. The R.A.F. frequently requires Dakotas to be converted for V.I.P. work, or for paratroop or normal passenger-carrying purposes in Transport Command. Dakotas which have been returned by U.N.R.R.A. have required overhaul and conversion, and the removal of the military camouflage to reveal the normal shining fuselage favoured by civil operators.

I saw at Gatwick, in the hangars, on the tarmac and on the airfield, 35 Dakotas in various stages of repair, conversion, modification and overhaul—there seemed to be Dakotas everywhere. At that base the company has done 253 scheduled overhauls in six months. On Ministry of Supply, B.E.A.C. and B.O.A.C. contracts alone at Gatwick 500,000 hours are being worked each week, and that goes on for 51 weeks of the year. In addition, the company is responsible for servicing the 18 aircraft in the M.C.A. fleet.

In the left foreground is a Beechcraft Traveller receiving a final check. In this hangar at Langley private owner and charter aircraft are undergoing repair and conversion.

Maintenance Overseas

Such is the maintenance responsibility to scheduled airlines and other users of medium-heavy aircraft at home, but Airwork also maintains and operates a fleet of aircraft for overseas purposes. At Abadan, for example, there are five Rapides and two Doves which are flown for the Anglo-Iranian Oil Company; at Haifa there are nine Rapides and three Doves for the Iraq Petroleum Company; and at Kuwait a Rapide is flown for the Kuwait Oil Company. Four Doves fly scheduled services from Khartoum for Sudan Airways, Airwork being responsible for the technical management of the airline; in Shell Mera, Ecuador, there are three Grumman Goose amphibians, two DC-3s, two Bristol Freighters and two Ford Trimotors employed in the transport of food, machinery and other supplies from established airstrips to survey parties in the interior for the Shell Company of Ecuador.

All these commitments involve the establishment of maintenance bases overseas with qualified staff. During the past six months in the whole organization about 60 Certificates of Airworthiness have been completed on all sizes of aircraft, and at the maintenance depots at Gatwick, Blackbushe and Langley 1,959 daily inspections were made. In the Middle East 2,700 and in Ecuador 1,500 daily inspections were carried out in the same period. Such dispersed maintenance responsibilities require a high proportion of skilled workers and Airwork employs a particularly large number of licensed craftsmen. At Gatwick there are about 550 employees, of whom about 28 are fully licensed. At Langley there are 200 employees, at Perth 60, at Booker and Blackbushe 80, and in Ecuador 20 plus local labour; in the Middle East there are about 35 English

A Viking at Blackbushe in an advanced stage of a 600-hour inspection. The Charter fleet comprises 6 Vikings and a Freighter.

employees who are assisted by locally recruited labour.

In the 140,000 sq ft of floor space occupied by Airwork at Gatwick, a relatively large portion is devoted to the overhaul of component parts—again, under contract to the Ministry of Supply. On arrival the components are stripped of fabric and paint in order that all damage may be detected. They are then examined by an inspector of the Airwork works inspection department, the chief inspector of which is approved by the Air Registration Board. Each inspector is consequently approved as a delegate of the chief inspector. After examination, a survey report is issued for each component; it is then passed to the planning department and directions are issued. The report includes the estimated time which should be taken for the repair to be completed, and if the repair is done in less time the mechanic receives cash benefit.

To enhance the already comprehensive service to operators, the company has at all times a party of licensed engineers ready to be dispatched for making immediate repairs on the site of an aircraft breakdown or mishap. In fact, at a few hours' notice a party comprising engineers of all grades could be available to travel to most places overseas, complete with passports and necessary clearance. Mr. R. W. Cantello, from his headquarters at Hounslow, is responsible as general service manager for the entire maintenance organization.

Blackbushe and Langley

We have so far examined only the activities at Gatwick and those overseas, but the organization embraces maintenance of the Airwork charter aircraft at Blackbushe, and the servicing of smaller aircraft at Langley. I must admit that there was little activity at Blackbushe at the time of my visit, since four of the six Vikings were out of the country; one was in Karachi, and the other three were at Wadi Halfa, Dar-es-Salaam and Kuwait, while the Freighter was on its way home from Stockholm. Two Vikings were in the hangar, one on a 600-hour and the other on a 35-hour inspection.

Charter flying is so arranged that when destinations are at a greater distance from base than can be covered by a total of 35 flying hours, a maintenance crew flies with the aircraft. All 100-hour or longer inspections are done at base, except of course when aircraft are operating indefinitely overseas. The normal run to Wadi Halfa takes a

(Above) : After the Bristol Freighter had returned from Stockholm Mr. R. W. Cantello (right), Airwork general service manager, examines the log books with Mr. S. J. H. Hammond, service manager, Blackbushe. (Below) : Dismantling a glider at Langley for delivery after checking. On the left is the Lancaster fitted with the Brabazon I elevator control mock-up, and in the background Denham Club Tiger Moth.

Gatwick.

AIR WORK . . . .

convenient 35 hours there and back, and since inspections follow a 35-hour cycle an inspection is completed on each return to Blackbushe. The Freighter was used as a passenger aircraft last year, but has now been converted for freight-carrying.

Blackbushe is a convenient airport for the company, which is fortunate in being established in No. 1 hangar on the operational side of the road and not affected by regulations which are likely to prohibit the use of the other side. All passengers flying to and out of this country in Airwork Vikings pass through Blackbushe, where there are full Customs and passenger-handling facilities, and an airfield, fitted with Fido, which has a good record for weather. Once again the policy of maintaining a high percentage of licensed engineers is evident, and in the charter division about 33 per cent of the total staff are fully qualified, a factor which must be contributory to the excellent maintenance and safety record.

Glider Inspection

At Langley the conversion, repair and maintenance of smaller types of aircraft is carried on. In the small hangars many R.A.F. Rapides have been converted for civil use; all the Denham Flying Club aircraft are serviced, and the Rapides used by the petroleum and oil companies, and Doves for the Sudan Government, go to Langley for major overhauls. The organization provides outside servicing primarily for private owner and charter operators, with additional special work such as the maintenance of the Sperry flying test aircraft and the development of a hydraulically operated power unit elevator control for the Brabazon I. The mock-up, which has been designed and constructed by Alan Muntz and Co., is fitted to a Lancaster.

Also at Langley all gliders used by the A.T.C. in the south of England, i.e., south of Hull, are inspected and repaired. Airwork are responsible for transporting the gliders from the gliding centre to Langley, and for returning them. Each A.T.C. glider is given an inspection after a thousand launches, but repairs are invariably necessary before that. There were about 35 gliders at Langley, all being patched, rebuilt and inspected in the noticeably silent shops, silent owing to the absence of metallic noises. Judging by the extent of damage to some of them, gliders receive some rough use. After inspection, repair and reconstruction, they are assembled for flying-controls and rigging checks. After that they are dismantled and sent away.

I have dealt with only a portion of the Airwork organization—that portion which from London is most conveniently examined and which is in fact most obvious. At Perth there is an organization similar to that at Langley for the repair and inspection of gliders, also a flying-training school and the Strathtay Aero Club. At Booker, Airwork also run a flying-training school.

(Above): Mr. Claude Trusk, Airwork's chief test pilot, as he climbs out of an Avro XIX after an air test is met by Mr. A. J. Burfoot, service manager, Gatwick. (Below): Mr. J. G. Langford and Mr. F. N. Brookes, works manager and superintendent respectively, at Langley.

The company has never been tied to the sale of the products of any one manufacturer, but has remained free to offer advice to prospective purchasers on the type of aircraft required for specific purposes. The sales organization has consequently been responsible for exporting overseas many post-war British aircraft. The charter section, in addition to many other commitments, flies a leave service for officials of the Sudan Government from Khartoum to England. Another contract has been the flying of tourists during the summer months to Switzerland for the Polytechnic Touring Association.

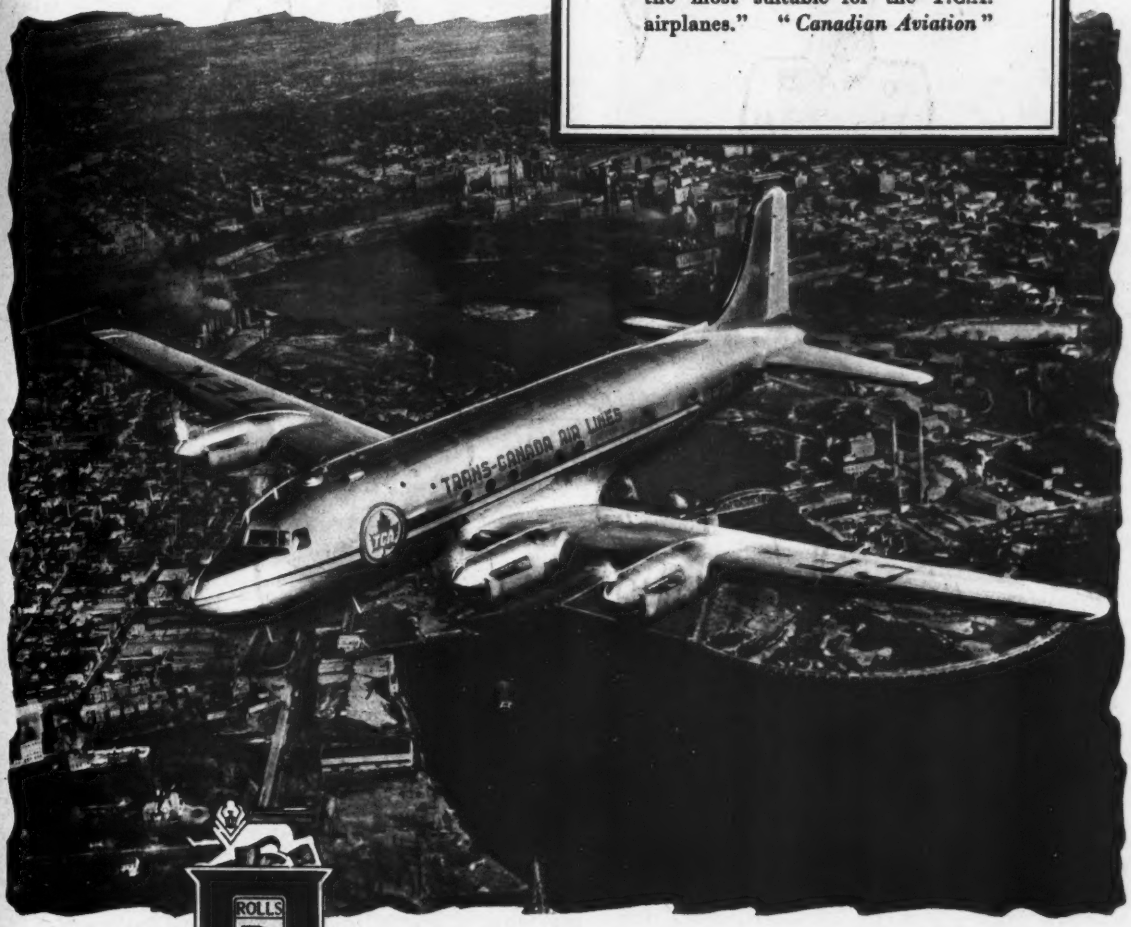
Mention must also be made of the Catering Section which originated in the establishment of a passenger restaurant in the old days at Heston. During the war the feeding arrangements for the flying training schools at No. 11 E.F.T.S. at Perth, No. 21 E.F.T.S. at Booker, and No. 14 E.F.T.S. at Elmdon, were taken over by Airwork. Wherever a branch of Airwork is now active there is normally also an industrial canteen and a restaurant, and at London Airport the company is responsible for all catering.

Airwork activities include, then, contract work for the Ministries, the Corporations, charter operators and private owners; contract flying for schools, clubs, airlines, and governments; and purchasing and selling aircraft. In addition, the firm owns and operates a fleet of 56 aircraft. It is, therefore, natural that such importance is attached to efficient maintenance.

Running-up one of the Corporation's Dakotas outside the hangar at Gatwick. Airwork overflowed from Heston into Gatwick in 1938, in order to do Whitley repairs.

SPEED AND RELIABILITY

"Determined to get the best engine for its particular transatlantic requirements, T.C.A. embarked on a detailed comparative study of all available engines including English and American types of liquid-cooled as well as air-cooled design. Weight, engine performance, range, ultimate performance and economic analyses were made from which it was decided the Rolls-Royce Merlin 620 would be the most suitable for the T.C.A. airplanes." "*Canadian Aviation*"



ROLLS-ROYCE *Aero* ENGINES

ROLLS-ROYCE LTD. DERBY London Offices Conduit St. W.

Time flies by Speedbird

B·O·A·C SPEEDBIRD ROUTES ACROSS THE WORLD

BRITISH OVERSEAS AIRWAYS CORPORATION IN ASSOCIATION WITH Q.E.A., S.A.A., T.E.A.L

UPTURNED LEONIDES

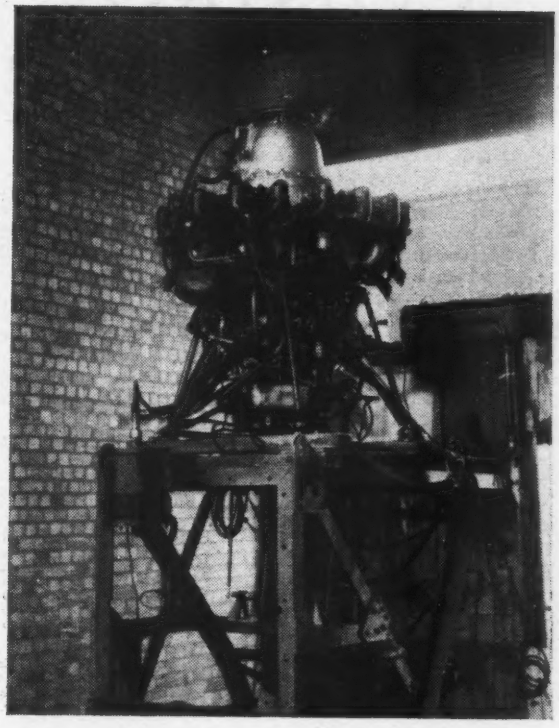
Early Helicopter Power Plant Tests

DURING a recent visit to Alvis Limited, *Flight* was able to see something of the progress which has been made with the Leonides helicopter power plants. At the company's Baginton test beds the development unit illustrated was seen running at full power. It is a standard Leonides with rear cover and oil system modified to permit running "on its back"—i.e., with the cylinders horizontal. The first such test made with the Leonides on its back comprised an eleven-hour run at full power (515 b.h.p., 3,000 r.p.m., 6.5 lb/sq in boost), and the engine performed faultlessly. The Fairey Gyrodyne is believed already to have flown with a Leonides, but in this case the engine is the normal way up and only differs from the standard in having a special gear box, clutch and drive.

For the engine intended to run on its back the rear cover has been modified to carry the sump, normally found between the lower cylinders and the C.S.U. The oil passages have also been rearranged to drain into the rear case and sump. The reduction gear is to be replaced by a Borg and Beck clutch, and provision is made for fan cooling. In all about 30 hours' running have now been made with an engine arranged with drive vertical.

Type test requirements are not yet known in detail, and it may be that the already type-tested engine will only be required to make a short run on its back for acceptance. The Leonides is now scheduled for a dozen new British and foreign aircraft, including helicopters, and among which are the Gyrodyne, Westland-Sikorsky S.51, Bristol, Cierva and also the Percival Prince and Short Sealand.

The standard nine-cylinder Leonides has a particularly small frontal area for its power. The overall diameter is 42in and the weight is 742 lb. In the case of the helicopter power plant the weight of clutch and drive will be much the same as that of the reduction gear and shaft they replace, therefore the power/weight ratio will be similar, namely 1.44 lb/b.h.p. Creditable figures for consumption have been achieved.



One of the early Leonides helicopter development engines running on its back at the Baginton test beds.

BOOK REVIEW

Brassey's Naval Annual, 1947. Edited by Rear-Admiral H. G. Thursfield. William Clowes and Sons, Ltd. 30s net.

RECENT aero-naval arguments involving technical requirements for future wars greatly increase the value of this latest "Brassey." Rear-Admiral Thursfield discusses "The Naval Prospect"; Captain E. Altham deals with "The Naval Year"; and Mr. Francis McMurtrie reviews "Foreign Navies." The collaboration of sea, land and air forces is the theme for Captain Cyril Falls, and *Volage* sets down his ideas on the future of naval aviation. Major Oliver Stewart ably presents the case for "The Operational Future of the Flying-Boat." Conclusions drawn from the 1946 atomic bomb trials are summarized, and appendices include tabulated data for naval aircraft and aircraft carriers.

On aeronautical matters, Mr. McMurtrie, in his contribution on foreign navies, seems to be somewhat at sea, and in the main confines himself to recapitulation of U.S. Navy press releases. In the opinion of *Volage*, the advent of the atomic weapon may well cause an increase in the demand for naval aircraft. There seems likely to be, he considers, a greater need for efficiency in air interceptions and a geographical extension of the areas in which they could be made. Here the carrier-borne fighter could be called upon to fulfil a new role, lying outside the usual fields of naval strategy. The second possible demand might be that arising from the advantages which carrier-borne aircraft can offer for the delivery of atomic missiles, if circumstances were ever again deemed to justify their use. A remark by *Volage* that the Sea Fury, Sea Hornet and hooked Vampire are all "in service in the Fleet" is unfortunately misleading, should the reader very naturally assume from this that the types are being extensively used by operational squadrons.

It is a matter for some regret that the tables of data for naval aircraft are incomplete, sometimes inaccurate, and generally in need of authoritative revision. Such shortcomings as there are in the book, however, detract little from its value as a guide to naval/sea progress during a vital period.

JETS FOR JUNIORS

AMONGST the rising generation a popular attraction of the Christmas holiday season is the annual series of lectures on scientific and technical subjects organized by the London County Council Education Department. Eminent scientists lend their services (and like it) and a good time is had by all.

This year they had an aeronautical treat. Dr. S. G. Hooker, of Rolls-Royce, devoted two afternoons to lecture at the Polytechnic Institute, Regent Street, on the development of jet propulsion. Rolls-Royce, Ltd., sent a part-sectioned Nene jet engine for examination. His talk was illustrated by lantern slides and by two films. The first, with excellent animated diagrams, dealt with the theory and early development of jet propulsion and showed the first British jet flight by the Gloster E28/39 in May, 1941. The second was the news-reel record of the Meteor flights by Mr. E. S. Greenwood and Group Captain H. G. Wilson when the world's speed record was established at 606 mph in November, 1945.

On the day *Flight's* representative attended, about a hundred keen youngsters from secondary schools, girls as well as boys, listened with rapt attention and later bombarded Dr. Hooker with serious, pertinent questions. A few brought their parents along and helpfully explained to them the inner details of the Nene.

Dr. Hooker was rewarded by the responsive interest and warm applause of his audience. The Rolls-Royce Co. earned full marks for treating the juniors seriously and sending a Nene —the real thing—for them to see and handle

SERVO CONTROL

Helicopter Stability Achieved in New Hiller 360 : "Finger-tip" Loads on the Stick

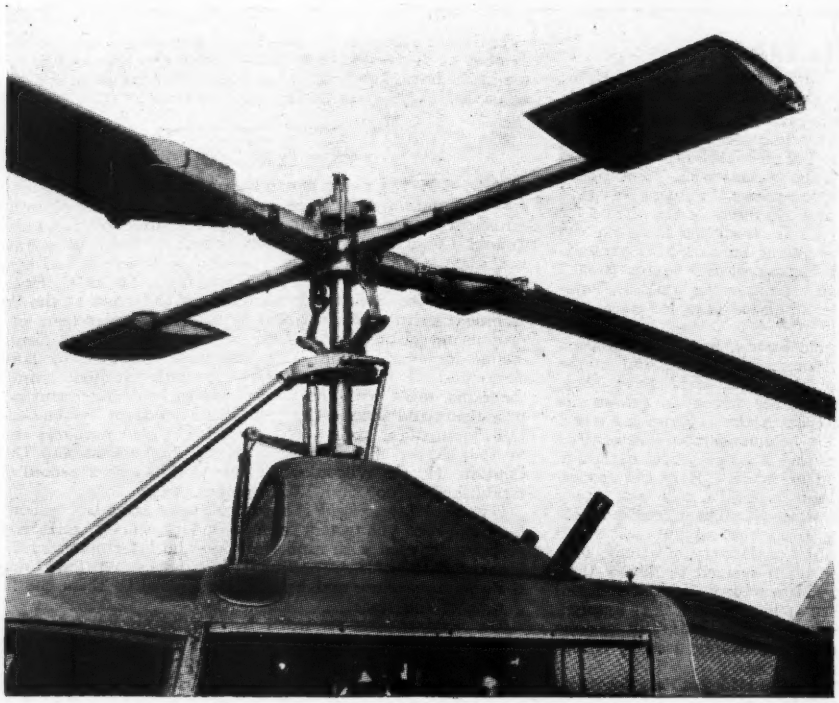
YOUNG Stanley Hiller Jun., president of United Helicopters Inc., of Palo Alto, California, appears to have achieved an important step forward with his latest type of rotor control, incorporated in the new Hiller 360, which is to go into production for the industrial and agricultural markets.

The first public demonstration of the new helicopter was given on December 11th, last. Flying just above the ground, Mr. Frank Peterson, the company's chief test pilot, let an assistant on the ground rock the machine, which immediately righted itself without the pilot touching the rotor controls, although we imagine that he still kept his feet on the pedals for the tail rotor. When suitably trimmed, the new helicopter can be flown hands-off for quite long periods. It is a three-seater with quite a useful disposable load, and giving about the usual helicopter performance in spite of the modest power output of 178 b.h.p.

The Hiller 360 is a three-seater with unusual features.

HILLER 360 SPECIFICATION

WEIGHTS :	
Gross (normal)	2,100 lb
Empty	1,353 lb
Useful Load	747 lb
Pilot and 2 Passengers (at 170 lb ea.)	510 lb
Baggage	60 lb
Fuel (27 gallons)	162 lb
Oil (2 gallons)	15 lb
FUSELAGE :	
Maximum Fuselage Width	5ft 3½in
Length (tail rotor vertical)	37ft 10in
Height (to top of cabin)	5ft 8in
Height (to top of rotor)	9ft 7in
CABIN DIMENSIONS :	
Width (at seat)	63½in
Length (seat back to nose)	53½in
Height (floor to roof)	49½in
POWER PLANT :	
Type	Aircooled Motors, Inc. Model 6V4-178-B32
Rated R.P.M.	3,000
Rated Power	178 h.p.
Power Loading (normal gross weight)	11.8 lb/h.p.
MAIN ROTOR :	
Diameter	36ft 6in
Number of Blades	2
R.P.M. (rated)	327
Tip Speed (normal)	590 f.p.s.
R.P.M. Ratio to Engine R.P.M.	1/9.17
ANTI-TORQUE ROTOR :	
Diameter	5ft 6in
Number of Blades	2
R.P.M. (rated)	1,875
Tip Speed (normal)	540 f.p.s.
R.P.M. Ratio to Engine R.P.M.	1/1.6



The new Hiller control system. The overhead stick operates the servo rotor which, in turn, controls the main rotor. The machine can be flown "hands-off."

At first sight the new Hiller control bears a certain resemblance to that of the Bell in that there is, in addition to the two-bladed main rotor, an auxiliary rotor of smaller diameter resembling somewhat the stabilizer bar of the Bell. Although there is probably a certain stabilizing effect due to the gyroscopic action, the novel feature of the Hiller is that the blades of the auxiliary rotor carry at their tips aerofoil surfaces of symmetrical section. These are in effect servo controls, and the pilot operates them through an overhead stick. The control rotor is connected to the hanging stick through simple "scissors" links.

Several advantages accrue from this arrangement. The

PERFORMANCE DATA*

High Speed	105 m.p.h.
Cruising Speed (70 per cent power)	85 m.p.h.
Range (27 gallons, 70 per cent power)	212 miles
Endurance (70 per cent power)	2.5 hours
Vertical Rate of Climb	400 f.p.m.
Maximum Rate of Climb	1,000 f.p.m.
Service Ceiling	Over 12,000ft
Maximum Vertical Take-off Altitude (no wind)	4,000 to 6,000ft
Maximum Take-off (forward run)	13,000ft

* Normal Condition—2,100 lb gross weight

loads on the stick are very small, as the pilot merely has to guide the control-rotor aerofoils which, in their turn, operate the main rotor blades. Since the stick is not connected directly to the main rotor, no vibrations are transmitted to the stick and to the pilot's hand (no more callouses!). By a simple trimming arrangement the system becomes stable at any steady speed, and even in the hovering condition. The use of an overhead stick reduces the number of links, with resultant saving in complication and weight.

It is expected that the Hiller 360 will go through its C.A.A. tests and get its airworthiness certificate during the next few months. Production and deliveries will begin later this year. The main data are shown above. It is interesting to note that the disposable load at normal gross weight is 4.2 lb per h.p.

New Year Honours

Peerage for Service Chief : Designers and Industry Executives Decorated : Many R.A.F. Awards

BARON

Marshal of the Royal Air Force Sir (William) Sholto Douglas, G.C.B., M.C., D.F.C., Commander-in-Chief and Military Governor, Germany, 1946-1947.

Marshal of the R.A.F., Sir Sholto Douglas—Baron.

KNIGHTS BACHELOR

John Douglas Cockcroft, C.B.E., Ph.D., LL.D., M.Sc. M.I.E.E., F.R.S., Director, Atomic Energy Research Establishment, Ministry of Supply.

Harry Ralph Ricardo Esq., LL.D., F.R.S., Chairman and Technical Director, Ricardo & Co., Ltd.

John Walker Stephenson, C.B.E., J.P., Deputy Chairman, British South American Airways Corporation.

ORDER OF THE BATH

K.C.B. (Military)

Air Vice-Marshal L. O. Brown.

C.B.

Air Vice-Marshal H. T. Lydford; Air Vice-Marshal G. A. Henzell Pidcock; Air Vice-Marshal W. E. Theak; Actg. Air Vice-Marshal T. C. Traill; Air Comdre. P. C. Livingston; Actg. Air Comdre. C. D. Adams.

K.C.B. (Civil)

Sir James Horace Barnes, Perm. Under-Sec., Air Ministry.

ORDER OF SAINT MICHAEL AND SAINT GEORGE

C.M.G.

Ludovic James Dunnett, Assistant Secretary, Ministry of Civil Aviation.

ORDER OF THE INDIAN EMPIRE

K.C.I.E.

Air Marshal Hugh Sydney Porter Walmsley, C.B., C.B.E., M.C., D.F.C., Air Officer Commanding-in-Chief in India and Deputy Supreme Commander (Air).

ORDER OF THE BRITISH EMPIRE

ROYAL AIR FORCE

G.B.E. (Military)

Air Chief Marshal Sir Alfred Guy Roland Garrod.

K.B.E.

Air Vice-Marshal M. B. Frew.

C.B.E.

Air Comdres. L. J. V. Bates, A. F. Hutton, Actg. Air Comdre. R. H. S. Spaight, Group Capts. J. Sullivan, F. Wright, F. J. Manning, D. C. Stapleton.

O.B.E.

Group Capts. C. C. Bazell, A. G. C. Somerhough, W/Cs. E. L. Colbeck-Welch, A. B. Kendall, T. U. Rolfe, H. G. Blake, G. G. N. Marshall, D. G. Scott, Act. S/Ls. F. P. McKenna, S. J. Marriott, G. S. Morris, A. H. Phillips, Act. W/O. Jean, L. A. Conan Doyle, Act. S/L. W. M. Mair, W/C. J. T. Davison.

M.B.E. (Military)

Squadron Leaders E. S. R. Coakes; W. A. G. Goldsworthy, R.A.F. (Ret.); Act. Squadron Leaders J. R. W. Adamson; J. H. P. Oxspring; Flight Lieutenants T. Harvey, M.B., Ch.B.; H. E. Huxley; F. A. V. Stoltz; Act. Flight Lieutenants W. G. Carr; M. Owen; Warrant Officers L. Ault; S. A. J. De Souza; A. Evans; R. E. Hartley; T. Horsfall; G. W. A. Lyddiatt; W. C. Sheppard; G. W. Sirman; Act. Flight Officer C. C. Harvey, W.A.A.F.; Section Officer G. M. Lamb, W.A.A.F.; Acting Matron M. E. Ball, A.R.R.C., P.M.R.A.F.N.S.

Major F. B. Halford, Chairman and Technical Director of the de Havilland Engine Co. Ltd.—C.B.E.

K.B.E. (Civil)

Wilfrid Charles George Cribbett, C.M.G., Deputy Secretary, Ministry of Civil Aviation; Sir Frank Spencer Spriggs, Managing Director, Hawker Siddeley Aircraft Co., Ltd.

C.B.E. (Civil)

William Frederick Connolly, M.B.E., Assistant Secretary, Air Ministry; Major Frank Bernard Halford, F.R.Ae.S., Chief Engineer and Director De Havilland Engine Co., Edgware; Major Andrew Alexander Ross, O.B.E., Chief Technical Adviser to the Director of Engine Research and Development, Ministry of Supply.

O.B.E. (Civil)

Raymond Noel Dorey, F.R.Ae.S., Manager, Hucknall Division, Rolls-Royce, Ltd.; George Nicholson, Manager, Scottish Division, British European Airways Corporation; Cyril Guest Phillips, for services as Assistant Director of Telecommunications, Ministry of Civil Aviation; Albert Gordon Store, Operations Manager, British South American Airways Corporation; Henry Charles Baden Thomas, Chief of the Aeronautical Engineering Branch, New York, Ministry of Supply; Wing Commander Henry Irving Wood, R.A.F. (Ret.), Operations Officer, Grade 1, Ministry of Civil Aviation; Herbert Eborall, M.B.E., Administrative Officer, Air Ministry; Marion Edith, Mrs. Felton Vesey Holt, Member of the Council, Royal Air Force Benevolent Fund; Captain Sydney Edward Moon, T.D., Chairman, Plymouth Wing Committee, Air Training Corps; Alfred Lawson, Principal, Air Ministry; Frederick John Scrase, Sc.D., Superintendent of Instruments, Meteorological Office, Air Ministry; Sidney Albert Brazier, Technical Manager, Dunlop Rubber Co., Ltd.

Mr. R. N. Dorey, B.Sc., F.R.Ae.S., Manager of Rolls-Royce Flight Development Division—O.B.E.

M.B.E. (Civil)

Horace Jerome Bingham, Station Superintendent, Poole, British Overseas Airways Corporation; William Henry Everett, Higher Executive Officer, Ministry of Civil Aviation; Geoffrey Taylor Greenhalgh, Senior Captain, British European Airways Corporation; Harry Boswell Norris, Senior Executive Officer, Ministry of Civil Aviation; Flt. Lt. Cecil Lawrence Pashley, A.F.C., Chief Instructor, South Coast Flying Club; Robert Roger Whyte, A.M.I. Mech.E., Assistant Superintendent, Gas Turbine Department, Metropolitan-Vickers Electrical Co., Ltd.; Ernest Frederick Abbiss, Staff Officer, Air Ministry; Hubert John Allwright, A.F.R.Ae.S., Scientific Officer, Ministry of Supply; Stanley Arthur Wesley Evans, Staff Officer, Air Ministry.

[*Further Honours will appear in the next issue.*]

CIVIL AVIATION NEWS

ISLAND SERVICE : A B.E.A. Dakota taking off from Jersey Airport. Figures for the period August-September in 1946 and 1947 show that last year, operating as the Channel Islands Unit of the B.E.A.C., 72,931 passengers were carried in 12,919 flights whereas the previous year as Channel Islands Airways 50,015 passengers were carried in 8,086 flights.

All-American Irish Policy : Established Tests for "B" Licences : L.A.M.S. Interest in Jewish Airline

PROVISIONAL TRAFFIC CONTROL

ON December 18th *Flight* published in detail plans for the segregation of air traffic over London and the introduction of a Metropolitan Control Zone. A provisional Air Traffic System for the United Kingdom and the establishment of the Control Zone is to come into effect as from next Thursday, January 15th.

As was previously explained, no Control Areas will be established for the time being, but they may be introduced as and when facilities become available. Notice to Airmen No. 1, 1948, explains that such zones have, however, already been established by certain states overseas. The system depends upon the observance by all aircraft at all times of the Rules of the Air as laid down in the Air Navigation (Consolidation) Order, 1923. With visibility of three miles or more, and when it is possible to fly not closer to cloud than 500ft vertically and 2,000ft horizontally, there will be no Air Traffic Control except in the vicinity of airfields. However, when weather conditions are such that aircraft cannot be flown in accordance with the minima, they will be subject, in certain localities, to the system of control laid down for Control Zones, and Control Areas when established.

A Control Zone is an air space of defined dimensions extending upwards, designated to include one or more airfields and within which certain rules apply for the protection of air traffic against collision. They are established to safeguard aircraft during take-off and approach in I.F.R. conditions, and flights within the Zone in I.F.R. conditions or at night are forbidden without air traffic clearance. Approach Control is responsible for giving such clearance, which involves the filing of flight plans by captains of aircraft at least 30 min before E.T.D. In the U.K. there will be areas known as Flight Information Regions, and smaller areas known as Control Zones. In Flight Information Regions clearance is not required before flight, but aircraft in transit above 1,000ft a.m.s.l. are required to obey the Quadrantal Rule.

The Metropolitan Control Zone, as illustrated in *Flight*, December 18th, is a wide area embracing, in addition to the main London airports, several secondary airports including Croydon, Gatwick, Bovingdon, and many airfields used by private owners and clubs including White Waltham, Fairoaks, Redhill, Elstree and Booker, and if the rules are observed literally there will be serious restrictions upon private and charter flying. The Ministry's regulations omitted to include the procedure for flight in I.F.R. conditions from one airfield in the Control Zone to another. It is understood that the Ministry intend to consult those most affected in order that some satisfactory regulations may be agreed. It would have shown consideration, however, had the situation been clarified earlier or mention been made in order to relieve somewhat the anxiety of the already restricted private and club flyers. The spectre of filing flight plans to obtain clearance is not as menacing as the first impression would convey, since it is understood that a telephone clearance on the spot by the traffic officer will normally be possible. The 30 min requirement is stated in order to avoid congestion at busy airfields, and filing the flight plan is Ministerial terminology.

IRISH AIRLINE'S POLICY

STARTING on March 17th Irish Airlines will fly two Constellation services a week from Dublin to Boston and New York and one direct to New York. The company are about to suspend services from Shannon to Paris and from Belfast to Liverpool, and the Dublin-Belfast-Liverpool service will be replaced by one from Dublin through Belfast to Glasgow. Last November Aer Lingus introduced Constellations on the Dublin to London service largely as an experiment. It was found to be successful, and by next spring only Constellations will operate on that route, flying six return trips daily carrying 58 passengers in each aircraft. At present the company owns a fleet of 25 aircraft made up of 7 Vickers Vikings, 10 Dakotas and 5 Lockheed Constellations and there are 2 Miles Geminis and 1 Airspeed Consul in the Charter and Taxi Division. The Vikings were purchased at a time when Dakota spares were extremely difficult to obtain in Europe and many operators were faced with the possibility of having unusable aircraft on their hands. The release of Dakota war-surplus spares in Europe by the Americans so improved the position, however, that Aer Lingus, like many other operators, was able to continue with Dakotas.

In order to avoid the operation of more than two types of aircraft on the main services the 7 Vikings are to be sold. It has been stated in some quarters that the British aircraft are being sold for reasons associated with uneconomic opera-

ROLLS-ROYCE

MERLIN ENGINES

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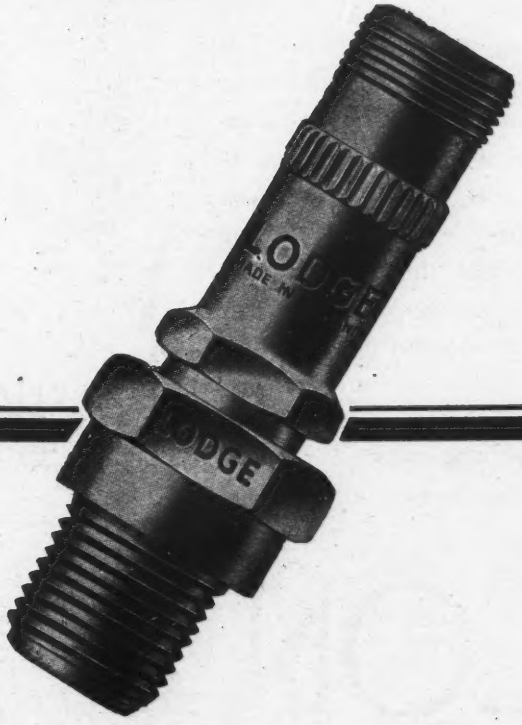
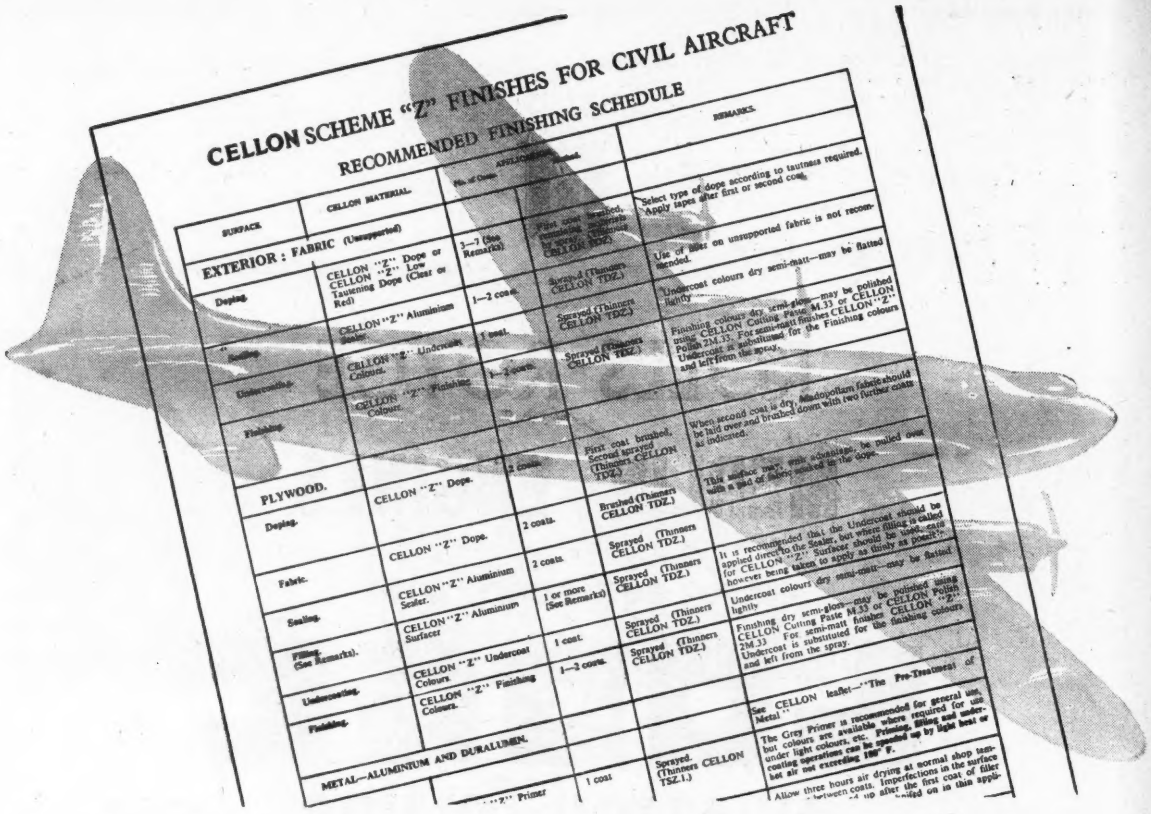
AVIATION PLUGS



Lodge Plugs Ltd., Rugby



CELLON SCHEME "Z" FINISHES FOR CIVIL AIRCRAFT

RECOMMENDED FINISHING SCHEDULE

SURFACE	CELLON MATERIAL	APPLICATIONS Req'd. No. of Coats	Method	REMARKS
EXTERIOR : FABRIC (Unsupported)				
Doping.	CELLON "Z" Dope or CELLON "Z" Low Tautening Dope (Clear or Red)	3—7 (See Remarks)	First coat brushed, remaining coats may be sprayed. (Thinners CELLON TDZ)	Select type of dope according to tautness required. Apply tapes after first or second coat.
" Sealing.	CELLON "Z" Aluminium Sealer.	1—2 coats.	Sprayed (Thinners CELLON TDZ.)	Use of filler on unsupported fabric is not recommended.
Undercoating.	CELLON "Z" Undercoat Colours.	1 coat.	Sprayed (Thinners CELLON TDZ.)	Undercoat colours dry semi-matt—may be flatted lightly.
Finishing.	CELLON "Z" Finishing Colours.	1—2 coats.	Sprayed (Thinners CELLON TDZ.)	Finishing colours dry semi-gloss—may be polished using CELLON Cutting Paste M.33 or CELLON Polish 2M.33. For semi-matt finishes CELLON "Z" Undercoat is substituted for the Finishing colours and left from the spray.
PLYWOOD.				
Doping.	CELLON "Z" Dope.	2 coats.	First coat brushed, Second sprayed (Thinners CELLON TDZ.)	When second coat is dry, Madapollam fabric should be laid over and brushed down with two further coats as indicated.
Fabric.	CELLON "Z" Dope.	2 coats.	Brushed (Thinners CELLON TDZ.)	This surface may, with advantage, be rubbed over with a pad of fabric soaked in the dope.
Sealing.	CELLON "Z" Aluminium Sealer.	2 coats.	Sprayed (Thinners CELLON TDZ.)	
Filling (See Remarks).	CELLON "Z" Aluminium Surfacer	1 or more (See Remarks)	Sprayed (Thinners CELLON TDZ.)	It is recommended that the Undercoat should be applied direct to the Sealer, but where filling is called for CELLON "Z" Surfacer should be used—care however being taken to apply as thinly as possible.
Undercoating.	CELLON "Z" Undercoat Colours	1 coat.	Sprayed (Thinners CELLON TDZ.)	Undercoat colours dry semi-matt—may be flatted lightly.
Finishing.	CELLON "Z" Finishing Colours.	1—2 coats.	Sprayed (Thinners CELLON TDZ.)	Finishing dry semi-gloss—may be polished using CELLON Cutting Paste M.33 or CELLON Polish 2M.33. For semi-matt finishes CELLON "Z" Undercoat is substituted for the finishing colours and left from the spray.
METAL—ALUMINIUM AND DURALUMIN.				
	"Z" Primer	1 coat	Sprayed. (Thinners CELLON TSZ.1.)	See CELLON leaflet—"The Pre-Treatment of Metal."
				The Grey Primer is recommended for general use, but colours are available where required for use under light colours, etc. Priming, filling and undercoating operations can be speeded up by light heat or hot air not exceeding 180° F.
				Allow three hours air drying at normal shop temperatures between coats. Imperfections in the surface may be filled up after the first coat of filler has been rubbed down with fine abrasive paper. Filler should be applied on in thin applications.

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The thoroughness of Cellon Technical Service is nowhere better exemplified than in the finishing schedules which set out in detail the exact procedure from pre-treatment to the final coat. These schedules comply with the latest A.R.B. requirements. You should add to your reference library "Cellon Aircraft Finishes" the booklet that contains the schedules. Other Cellon literature that may interest you includes "The Pre-treatment of Metals" and "Stoving Finishes". Write for them today; and remember that Cellon Technical Service will gladly and freely send an expert to your works to study your finishing problems on the spot.

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Civil Aviation News . . . . .

tion. Such an explanation, however, is most unlikely, since the experience of British European Airways, which holds a 40 per cent share in Aer Lingus and has converted from Dakotas to Vikings, is that the Viking is a more economic aircraft than the Dakota over similar routes to those operated by Aer Lingus. There may be other reasons for concentrating upon the operation of American aircraft and which can in no way reflect upon the Vickers aircraft. The situation has been dealt with in *Outlook* in this issue.

It is rather interesting to note that route mileage of Aer Lingus increased from 1,040 in December, 1946, to 4,707 in December, 1947. In 1946 52,365 pasengers, and last year 131,936 passengers were carried. During the year 11 new services were introduced, including those from Ireland to Paris, Brussels, Amsterdam and Rome.

AMBASSADOR MODIFICATIONS

THE first prototype Ambassador is undergoing those routine modifications which have been found necessary in the ordinary course of testing. It is understood that in the early stages of flight trials Mr. Errington was of the opinion that on the ground, which of course included take-off, the aircraft was inclined to be nose-heavy, and as an experiment the angle of the main undercarriage legs was decreased, which naturally had the effect of moving the unit slightly forward. The experimental alteration had the desired effect, and it is now considered necessary to strengthen the structure in its new position before flying at an all-up weight of 47,000 lb. The Ambassador prototype has already flown at its designed all-up weight of 45,000 lb.

AUSTRALIAN GOVERNMENT REVERSES POLICY

A SUDDEN change has taken place in the Australian airline fare controversy with the announcement by Mr. Drakeford, the Minister for Air, that his department would not interfere with airline fares provided that they did not exceed the maximum agreed upon at the recent conference. This is a complete reversal of policy, as the Ministry has been threatening Ansett Airways, who had insisted on *reducing* fares below the agreed minimum, with dire consequences, including even the refusal of use of airfields and navigational aids. Trans-Australia Airlines have announced that they will charge the lowest fare between any two points, but Australian National Airways have stated it is not their intention to reduce fares.

It has recently become known that in April, 1946, the National Airlines Commission offered Australian National Airways £3 million for the company, but A.N.A. refused the offer. It is also believed that an offer was made for Ansett Airways but the company would not sell without an offer of an additional sum for gooowill.

AIR REGISTRATION BOARD NOTICES

THE Council of the Air Registration Board has included in the first Notice of 1948 to Licensed Aircraft Engineers and Owners of Civil Aircraft a foreword dealing with the procedure for their publication and distribution. Inquiries regarding the supply of Notices should be addressed to the Publications Department, A.R.B., Greville House, 37, Gratton Road, Cheltenham, Gloucester, but inquiries regarding their technical content should be addressed to the Secretary, A.R.B., Brettenham House, Strand, W.C.2.

Notice No. 23 was issued on December 24th and concerns Cirrus engines. A case has been reported of a ball joint becoming detached from the spring-loaded socket on ball and socket joint type EA-767/3 resulting in complete loss of power during flight. The Notice describes the precautions which must be observed before any further flying is attempted on any aircraft fitted with Cirrus Minor or Major engines.

"B" LICENCE ENDORSEMENTS

AS from January 15th all applicants for a pilot's "B" licence and those who wish to have a further type of aircraft entered on their "B" licence will be required to submit evidence of having carried out satisfactorily on that type, certain manœuvres. The required manœuvres include, for multi-engined aircraft, by day at maximum landing weight, all manœuvres used in normal flight including take-off and landing, landing with one engine inoperative, and emergency manœuvres including simulated engine failure after take-off, and approach to the stall in both level and banked attitudes. All manœuvres used in normal flight including take-off and landing are also required at night at the aircraft's landing weight. Similar manœuvres are required also with one engine inoperative, with the exception of a take-off. At the maximum permissible all-up weight one take-off must be done by day or by night. For single-engined aircraft all manœuvres used in normal flight, simulated forced landings and recovery from stalls from level and banked attitudes must be flown by day.

For certification a qualified observer must fly on board the aircraft, he must certify that the applicant was at the controls and that he witnessed these manœuvres. The tests must have been made six months before each application but may have been done in any order, on different flights, and they may be certified by more than one observer. Certification will normally be accepted from the holder of a current "B" licence endorsed for the type of aircraft to which the application refers, and a form of application (M.C.A. Form 528) when completed will be accepted as evidence that the requirements have been met. Applicants will also be required to pass an Air Registration Board examination on the type.

The rather loose term "normal manœuvres" is understood to include climbing, gliding, and the usual turns at various rates.

FLIVVER HELICOPTER: Mr. D. K. Jovanowick, of the Helicopter Engineering Research Corporation, has designed what is stated to be the cheapest helicopter on the American market, the JOV-3, which with a moderate production will cost between 7,000 and 9,000 dollars. With two rotors and their complications, this seems optimistic.

GROWTH OF U.S. OPERATIONS IN 1947

STATISTICS covering the air traffic in the U.S.A. have been issued by the Civil Aeronautics Administration. The number of civil aircraft rose from 81,000 in 1946 to an estimated 95,000 in 1947 and it has been estimated that there were 455,000 licensed pilots. Airlines increased their fleets from 826 aircraft to 965 by the addition of 156 four-engine machines and the withdrawal of 17 smaller types. There was a drop in civil aircraft production from 35,000 in 1946 to 15,800 in 1947. Corresponding with the increase in the number of aircraft, airfields increased from 4,490 to 5,850 and the Federal government airport building programme began with the approval of 127 projects, mostly airfields serving small communities. Although the domestic accident rate rose, overseas airlines improved their safety record by reducing the 1946 figure of 3.5 passenger fatalities for 100,000,000 miles to 1.1 in 1947. U.S.

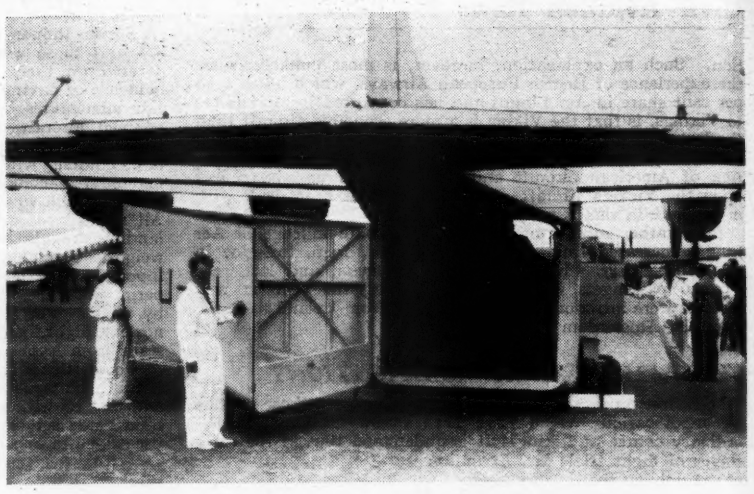
Civil Aviation News . . . . .

airlines carried 1,500,000 passengers overseas and nearly 16,000,000 passengers on internal routes, increases of 44 and 18 per cent respectively. Freight carried rose 84 per cent on domestic lines and more than doubled on overseas routes.

An analysis of British civil aircraft as registered on December 15th last year showed 337 in use by the airline Corporations, 478 by charter operators, 305 by Clubs and training schools, and the total, including those used for private and all commercial purposes, was 1,817.

JEWISH AIRLINE

A CO-DIRECTOR of London Aero and Motor Services, Mr. Abel Shaban, has announced in South Africa the formation of a Jewish airline, to be called Jewish National Airways and owned partly by L.A.M.S. and partly by the Jewish agency in Palestine, the former being responsible for operational and technical arrangements. Plans are being made to acquire DC-4s, it is understood, and to operate scheduled services within and from Palestine to London, New York, Prague, Johannesburg and other cities. All aircraft will bear the Star of David, there will be no services on Saturdays, and kosher food will be served on board. The Jewish agency will, of course, be either a government body or the government itself when an independent state is set up in partitioned Palestine, and it is expected that it will hold a controlling interest in the new airline.



POSSIBLE REPLACEMENT ?—The rear fuselage of the Miles Merchantman hinged back, showing the spacious interior which is capable of accommodating 20 passengers. The hinged portion is available for baggage. As suggested in "Flight" last week, this aircraft could perhaps be a suitable replacement for the D.H.89 on internal routes in the U.K.

U.S. FARES LOWER THAN PRE-WAR

ACCORDING to the Air Transport Association of America the fares on the country's most heavily used internal airlines were, for the most part, lower than those charged before the war.

Of the 24 routes examined only 8 showed fares greater than those charged in 1941, the greatest increase being on the Chicago-St. Louis route, which had risen to 16 per cent more than the old fares. New York-Syracuse fares were at only 78 per cent of the 1941 level and on the Detroit-Cleveland route the figure was only 75 per cent. On the average, fares in the 24 cases which were the subject of the survey were at 94 per cent of the pre-war average.

S.A.S. EUROPEAN SERVICES

WHEN the board of directors of S.A.S. met in Copenhagen last month statements were made about the desirability of increased co-operation between the Scandinavian countries on the European routes. This was later elaborated by the president of S.A.S., Mr. Per A. Norlin, who said that investigations into the subject were soon to be started and that they were prompted by the success of the joint Atlantic scheme. He forecast a joint sales system, more closely knit maintenance and operations, with the painting of S.A.S. insignia on all aircraft in addition to the insignia of the companies concerned. At the moment, the views of the boards of the individual companies are awaited.

INTERNATIONAL RED TAPE

THE Special Advisory Committee set up by President Truman to study air transport problems in the U.S.A. is expected to suggest very soon a plan, the object of which will be to reduce "bureaucracy" in the running of world airlines. The Committee has estimated that U.S. airlines alone spend nearly £2,500,000 yearly on measures to ensure compliance with international regulations. If this cost were dispensed with a cut of £25 in Atlantic single fares could be made. There was every justification, the report stated, for saying that though any place in the world was within 60 hours flying-time distance of America, it took more than 60 hours to obtain personal papers for the journey, and one American journal had estimated that 2,802 pages of completed documents were necessary before a commercial airliner could proceed from San Francisco to Australia. One proposal was the creation of free airports—a system already adopted in Eire whose Shannon airport allowed transient passengers to pass through without documents.

SUSPENSION OF PILOTS AFTER ACCIDENTS

IN his report on an air accident in which 14 persons lost their lives on July 13th, Mr. Carl Donlan, consultant to the Senate Commercial Aviation Sub-committee, proposed automatic suspension of pilots for a given period and re-examination after an accident. He claimed that statistics showed that pilots who had had one accident were more inclined to have another and were considerably less efficient than those with a clear record. With regard to the accident that was the subject of his report, he said that the pilots had been in the air for 23 out of 37 hours and were either asleep or exhausted, and suggested that "drastic proceedings should be instituted against the management and/or the owner."

PETROL TRANSFER IN FLIGHT CRITICIZED

TRANSFER of petrol from the main to the feed tanks in flight was strongly condemned as unnecessary and dangerous by Mr. Don. Douglas, Jun., in charge of testing for the Douglas Corporation, in a statement he made at the C.A.B. committee of enquiry into the DC-6 crashes. It was established at this enquiry that the fires which caused the accidents arose from the overflow of petrol from the gravity tanks, which had seeped back along the fuselage and reached the cabin heaters.

"Transfer of petrol in flight is safe only if there is no accompanying overflow," he said. "At the time the DC-6 was granted its C. of A. we did not realize the seriousness of petrol overflow." He went on to say that under no conditions of flight was it necessary to use cross-feeding for the transfer of fuel.

MAPPING CANADA

SINCE the Photographic Survey Co., Ltd., was formed in Toronto, Canada, in February, 1946, as a subsidiary of Hunting Aviation, a number of surveys have been completed and others are still in progress in Canada and South America. In Northern Ontario 125,000 sq. miles are being surveyed for a forest inventory on behalf of the government, a contract which will take five years to complete, and the Newfoundland Commission of Government has a 5,000 sq. mile survey in Labrador for the same purpose. For the Federal Government 90,000 sq. miles in British Columbia are being photographed for mapping and the government of Nova Scotia has 11,000 sq. miles of its territory already mapped. On behalf of six pulp and paper mills, 5,000 sq. miles in British Columbia, New Brunswick, Northern Ontario and Quebec, and 3,000 sq. miles on behalf of mining companies, have been photographed, and a town-planning survey was made of the greater metropolitan area of Toronto. Not all the surveys were on a large scale, since about 30 were of 1-10 sq. miles each. Two of the most important overseas contracts were for 10,000 sq. miles in Venezuela and 8,000 sq. miles in Colombia. The control points for surveying the vast areas were established in most cases by astronomical observations.

BREVITIES

The Australian government is reported to be transferring responsibility for the services to New Guinea from Qantas to T.A.A.; Qantas will fly international routes only.

* * *

It is believed in American civil aviation circles that modifications being adopted or considered for DC-6s will keep these aircraft grounded until March. It had earlier been hoped that they would be in service again this month.

* * *

A commission appointed by the Italian government has recommended Maccarese as the airport for Rome. Six runways are planned and development of the site, which is northwest of the city, will cost about 12 million lire.

* * *

The second assembly of the International Civil Aviation Organization will be held at the Palais des Nations in Geneva, Switzerland. The session will begin on June 1st, 1948, and is expected to last about three weeks.

* * *

The Saab company of Linköping, in addition to extending production of the Scandia, will shortly introduce a development known as the Scandia 90A II, powered by two Pratt and Whitney type R-2180 engines. The maximum speed is expected to be increased to 285 m.p.h.

* * *

Pan American Airways estimate that when the full figures for 1947 are available the airline will be found to have had a record year, with about 951,500 passengers carried compared with 854,570 in 1946; and 31,371,000 lb of freight, compared with 17,029,700 lb last year.

* * *

F.A.M.A., the Argentine airline, has reduced scheduled flying time on the London-Buenos Aires service by 24 hours in each direction by eliminating the overnight stop at Lisbon. A stop of one hour is now made at Madrid, and a day at Natal; the other intermediate stops, Paris and Dakar, remain unchanged.

FOR CONFINED SPACES: An Irvin Bell helicopter being taken through a partially opened hangar door at Hanworth. The two-bladed rotor has advantages over the three-bladed rotor for parking and storing.

An increased number of seats in the Air France services to Algiers, Trinidad, Lydda and Teheran has been allocated to the London, Manchester and Glasgow offices of the company.

* * *

The Swedish Civil Aviation Board has recommended that Trälleborg, near Malmö and 31km from Kastrup, should be the main airport for Southern Sweden. Work will not be started just yet as all efforts are being concentrated on Halmsjön. In the meantime, the runways at Malmö (Bulltofta) are to be strengthened.

* * *

November was a record month for air freight between Miami airport and South America. Pan American Airways handled 1,267,631 lb of cargo, double the freight in November, 1946.

* * *

A scale of wages ranging from £375 for a non-flying probationary radio officer to £725 for a senior radio officer of more than four years' service, with a transoceanic bonus of £125 a year, has been awarded by the emergency disputes committee set up to settle the strike of Tasman Empire Airways radio operators.

* * *

Considerable increases in the amount of mail flown by domestic air routes in the U.S.A. occurred in July and August. In July ton-miles were 11.35 per cent higher than in the same month last year and in August 10.85 per cent. Increases in express ton-miles were 17.62 and 25.78 per cent respectively. In July and August 98.76 and 99.10 per cent of scheduled mileage was flown; about 62 and 67 per cent of available seats were occupied in these two months.

* * *

In the December issue of the Handley Page bulletin, Col. E. J. P. Ryan, now the S.B.A.C. representative in the Middle East and Greece, recalls a flight in an H.P.9 from the Ellenborough Race Course, Calcutta, in 1920. The machine was operated by Handley Page Indo-Burmese Transport, Ltd., and flew a number of Indians. "The Indian heroes of the flight," says Col. Ryan, "were feted as people who had returned after facing certain destruction."

FROM THE CLUBS

Instead of a cash subsidy New Zealand flying clubs were given 40 free Tiger Moths, and £4 dual, £3 10s an hour solo for training 150 A.T.C. cadets each year. Now the clubs are complaining that the Tiger Moths are those remaining after the pool had been picked over by private purchasers for eighteen months, and that the flying instruction will cost over £4 an hour. Without cash assistance, it is said, some of the smaller clubs will not survive and, in general, flying will become a rich man's sport.

* * *

In the second year of post-war activity, members of the Cambridge and University Flying Clubs operated by Marshall's Flying School flew a total of 2,020 hours, including 55 hours night flying, in the fleet of six Tiger Moths and two Austers. It is two of the Tiger Moths which are equipped for night flying. During the year 25 members gained "A" licences, and two "B" licences, while three instructors' courses were completed, and 25 pupils made their first solos. Members are now able to use the Volunteer Reserve Social Club which opened last autumn in the airport buildings.

* * *

News comes from the Cinque Ports Flying Club at Lympne that despite restrictions a considerable number of hours are still being flown, especially at week-ends. Membership was increased recently by one—when a baby daughter was born to the managing director, Mrs. Attree, on December 27th. We understand from a very relieved godfather, G/C. Eustace Miles, that Ann, Ray and the daughter are in excellent form.

* * *

A new gliding club has recently been formed in the Gloucester area and already a prospective membership of seventy names has been registered. A winch and towing vehicle have been acquired and the first aircraft will probably be a Kirby Cadet.

Staverton airfield (on the Gloucester-Cheltenham road) is the intended base and flying is expected to start in April. One of the more particularly interesting aspects of this new club is that investigation of the many potential soaring sites in the Cotswolds will be made.

A temporary committee has been elected with W. Schultes as Chairman and Chief Flying Instructor, the Secretary is E. Holloway of 70, Portland Street, Cheltenham, and Gordon Wilkins is handling press relations. Membership fees are £1 1s admission and £4 4s per annum.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THE FLYING-BOAT CONTROVERSY

JOHN LANKESTER PARKER might well have added, as a further argument in favour of flying boats, that the construction of bases for them does not sterilize acres of valuable agricultural land as do the bases for landplanes.

Surely, also, the alighting load is distributed more evenly over the bottom of a boat, whereas in a large landplane a great load is suddenly taken at high speed on very small areas of just a few wheels. Hence that horribly frightening sight of frequent smoke puffs from the wheels on contact.

GEOFFREY DORMAN.

As the Non-technical Passenger Sees It

FROM time to time the leading aviation journals publish articles, short stories, news items or technical reports on the much-debated subject of "Flying Boats versus Landplanes." In most of these the substance is based on material which has proved to be correct, and on scientific data which are automatically correct. The theoretical data which back these articles are usually beyond reproach, but the most important item is invariably either forgotten or deliberately omitted—do the people who are the potential passengers want to fly in a landplane or in a flying boat?

We all know that there are certain basic factors which have forced the flying boat into the background for many years now, but there are also many points which have forced it into the foreground. Servicing operations, suitable sheltered waters, slow speeds, water handling and embarkation of passengers are some of the reasons for leaving the flying boat alone as a commercial proposition. Those are the simple, straightforward items which cannot be overlooked at a glance.

I feel, however, that they are only a handful of minor points which would amount to nothing if more attention were given to the future of the flying boat as a luxury passenger aircraft, designed to bring the flying public into a new sphere of aviation. Let it be a new kind of transport for the semi-mariner and the semi-flyer, for those who like the comfort of a spacious ship but are always seasick, who like to fly but are always cramped.

The flying 'boat was forced into the background because landplanes were easier to land, were simpler to handle, were faster and were more aerodynamically perfect. That was during the war, when force of circumstances was always the deciding factor. This is peace once more, when those who want to fly are allowed to fly, and when the services go their own way and trouble no one.

Because I was essentially a flying-boat pilot during the war, I came in close contact with them, and perhaps that in itself is reason enough to enable me to try to reveal an opinion which is held by all the flying-boat pilots I have met.

Surely then it is the factor of passenger psychology that should be put into the foreground of civil transports. The passenger who flies on business is one of the most important of this variety of fliers who must be thoroughly satisfied. It is no use taking the occasional traveller as an example, as he is obviously a person who has chosen to go by air, either as an experience, an experiment, an adventure or to save time on a short holiday. At the most he will fly only an handful of times each year, and a flight will always give him a certain amount of excitement.

Let us then take the business man as the type of passenger for whom flying will have to cater more and more as time goes by. What exactly does he want? There are nine things he wants:—

1. Comfort.
2. Space.
3. Freedom to walk about.
4. A feeling of living in a massive powerful structure.
5. Steadiness.
6. All the comforts of a ship's cabin if flying by night.
7. A sense of security—that the aircraft can land on water.
8. As little fuss as possible on embarking or disembarking.
9. Good food eaten on a set table.

How many of these can be offered in the greatest landplane of today? None; but they are offered in the flying boats of today and the flying boats of yesterday. The famous Boeing Clippers, which were flying the Atlantic up till a few months ago, had all those comforts and many more besides. Then why all this talk about the flying boat being the aircraft of yesterday?

It would seem that something was radically wrong with the designers of today; but that is not the case. The flying boat unfortunately must always be a larger aircraft than its landplane counterpart because of one esssential point. The hull must be capable of standing up to tremendous pressures on landing in rough seas and in taking off. The hull has also to be deep in order to raise the airscrews clear of the water. Yes, that is an important point, but will it be so important in a few years—or months—or is it so important now? Airscrews will soon be things of the past, the jet engine has seen to that—a flying-boat fighter has already appeared in this country—several large flying-boat transports are nearing completion. It is true they still have their large hull offering a strong air resistance, but that will soon be overcome when the hull can take on cleaner lines, lower lines, wider lines—when jet engines are introduced.

The landplane:— It can land on a hard runway and draw up outside the airport building without much trouble, and so can the flying boat at a base which has been properly designed. There need be no disastrous congestion in the circuit because many flying boats can land at once, and can rest on the water until they can be berthed.

But taxying on water is a most cumbersome job with four engines revving-up, throttling back, with winds and currents trying to twist the hull in all directions? Oh, no! Taxying on a modern flying boat can be just too simple. Reversible airscrews are the answer, and these were fitted to the *Coronado* used during most of the war as a giant freighter and a transatlantic passenger aircraft with the R.A.F. It was quite simple to turn it in any direction on the water, to glide sideways, backwards or forwards.

Speed! That is the question of today—the large hull again, the greater air resistance—not aerodynamically clean, too slow. The jet is coming very soon, the hull can change its shape, the speed can be increased, and increased beyond a brother landplane.

What is all this talk about speed, speed, more speed. Is it so vital to use only certain aircraft because they can go 30, 40 or 50 m.p.h. faster than another? Is the passenger interested at all in such a figure? To have all the advantages of a flying boat and to be able to go in a landplane at 50 m.p.h. faster—which is the better proposition?

Those long flights of thousands of miles, over barren wastes, through dangerous storms and in tropical suns; I can only say that I see no room for argument. I sat in the comfort of a flying boat with its high wing structure and I could look down without obstruction, while above me the solid wing sheltered my eyes from the sun. I looked at the ocean and wished I could land, I never thought of speed, it was far too comfortable.

I don't think there is anything more fascinating to watch than the take-off of a large flying boat over a stretch of water; nor is there anything more thrilling than the feeling of a huge hull skimming over the surface at up to 100 m.p.h.

Only a small point to add in favour of the flying boat. We know by now that all the aids to blind approach are merely aids, and that the skill lies with the pilot. But the flying boat has vast areas to land in if fog is covering the surface of the sea. There is no need to worry—a flying boat can be landed without the pilot looking out of the window, so long as he knows there is sea below him.

A pilot can sit in his cabin, put the aircraft in such a position, keep it at such a speed that he can bring it down steadily and surely until he feels the hull touch the water. He then cuts the throttle and the plane has landed blind—safely, easily, and without any trouble.

Let us hear more of the flying boat; of its past history; its war history over the oceans of the world; its temporary bases where no landplanes will ever reach; its endurance; its safety; its appeal to the passenger of today.

ROBERT RUSSELL.

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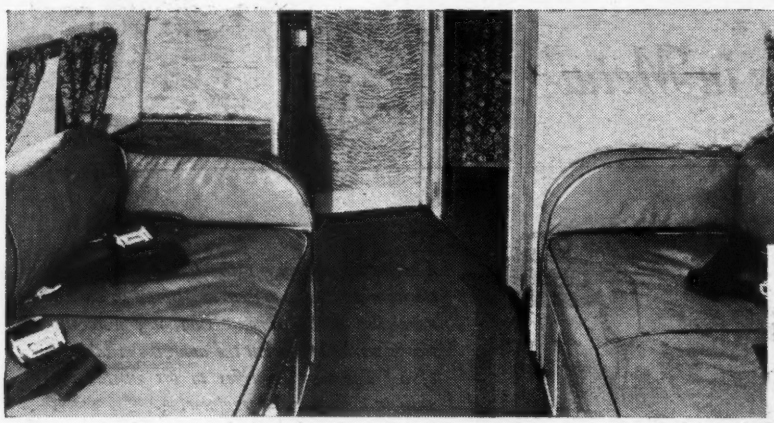

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Appointments

THE Air Ministry announces the following appointments: Air Marshal Sir George Pirie, K.B.E., C.B., M.C., D.F.C., as Inspector-General of the Royal Air Force, with effect from January 1, 1948, vice Air Chief Marshal Sir Norman H. Bottomley, K.C.B., C.I.E., D.S.O., A.F.C., who is being placed on the retired list at his own request.

A.V-M. John Whitworth Jones, C.B., C.B.E., to be Air Officer Commanding, Air Headquarters, Malaya.

A.V-M. John Denis Breakey, C.B., D.F.C., to be Air Officer in Charge of Administration, Bomber Command.

Air Marshal Sir George Pirie was appointed Air Commanding-in-Chief, Air Command, South-East Asia (now known as Air Command, Far East) on April 30, 1946, and was formerly deputy Air Commander-in-Chief, Air Command, South-East Asia, from June, 1945. Prior to that he was for two years Director-General of Organization at the Air Ministry, following a short period as Director of War Organization. From Sept., 1941, until April, 1943, he was Air Officer in charge of Administration at R.A.F. Headquarters, Middle East, after having been for nearly four years Air Attache at Washington.

Air Chief Marshal Sir Norman Bottomley has been Inspector-General of the Royal Air Force since January, 1947, and was formerly A.O.C.-in-C., Bomber Command, succeeding Marshal of the Royal Air Force Sir Arthur Harris in this post in September, 1945. Prior to that he was Deputy Chief of the Air Staff from August, 1943, and was formerly Assistant Chief of the Air Staff (Operations) and Deputy Chief of the Air Staff. Before going to the Air Ministry to take up this appointment in 1941 he was A.O.C. No. 5 Group, Bomber Command, for six months, and was previously Senior Air Staff Officer at Bomber Command Headquarters from Nov., 1938.

A.V-M. Jones was until recently Director-General of Organization at the Air Ministry to which post he was appointed in June, 1945. He was previously Assistant Deputy Chief of Air Staff, South-East Asia Command, from Nov., 1943, and was formerly Air Officer Commanding No. 9 (Fighter) Group and No. 84 Group (2nd Tactical Air Force), in turn. From February, 1941, until towards the end of 1942 he was Director of Fighter Operations at the Air Ministry, where he had previously served for several years in the Directorate of Intelligence.

A.V-M. Breakey was A.V-M. Jones's predecessor as Air Officer Commanding at Air Headquarters, Malaya, where he was posted in October, 1945, after having been A.O.C. No. 222 Group in Air Command, South-East Asia, for a short period. Previously he was Assistant Chief of Air Staff (Technical Requirements) from April, 1943, and before that he was Director of Operational Requirements at the Air Ministry for two years after having served since September, 1937, in the Directorate of Intelligence at the Air Ministry.

Royal Air Force and Naval Aviation News and Announcements

New A.O.C. in East Africa

AIR COMMODORE ALAN GEORGE BISHOP, C.B.E., A.F.C., who has been Air Officer Commanding, Air Headquarters, Italy, since March, 1947, has succeeded Air Cdre. N. A. P. Pritchett at A.O.C. Air Headquarters, East Africa. In the recent war he served in the Far East before being taken prisoner by the Japanese. Air Comdre. Pritchett has been appointed Director of Manning at the Air Ministry.

A Naval Job

THE Fireflies which carried out the strike on the derelict U-190, depicted in *Flight* of December 4th last, belonged to No. 18 Carrier Air Group, Royal Canadian Navy, and not to the R.C.A.F. as stated. A member of the group points out that, in any case, Fireflies are not operated by the R.C.A.F.

Lord Portal Joins Benevolent Fund

MARSHAL OF THE ROYAL AIR FORCE, Lord Portal of Hungerford, formerly Chief of Air Staff, has joined the Council of the R.A.F. Benevolent Fund as Deputy Chairman. He succeeds Dame Helen Gwynne-Vaughan who has retired after serving on the Council since 1920. Dame Helen has been elected a Vice-President of the Fund.

Air Chief Marshal Sir John Slessor, formerly an ex-officio member of the Council in his capacity of Air Member for Personnel, has been re-elected during his tenure of office as Commandant of the Imperial Defence College. Other new ex-officio members are Air Marshal Sir Arthur Sanders, on appointment as Air Officer Commanding-in-Chief, British Air

Service Aviation . . . .

Forces of Occupation in Germany (in succession to Air Marshal Sir Philip Wigglesworth); Air Marshal A. B. Ellwood, on appointment as Air Officer Commanding-in-Chief, Bomber Command; Air Marshal Sir William Elliot, on appointment as Air Officer Commanding-in-Chief, Fighter Command (in succession to Air Marshal Sir James Robb); Air Marshal Sir Brian Baker, on appointment as Air Officer Commanding-in-Chief, Transport Command; and Air Marshal Sir Hugh Lloyd, on appointment as Air Commander-in-Chief, Far East (in succession to Air Marshal Sir George Pirie).

It is also announced that W/C. W. H. N. Shakespeare has been appointed to represent the R.A.F. Association on the Council of the R.A.F. Benevolent Fund.

A.A.F. *Squadrons Converting*

ASKED by F/L. A. M. Crawley (Labour, Buckingham) whether it was proposed to make changes in the role of any of the Auxiliary Air Force squadrons, Mr. Geoffrey de Freitas, Under-Secretary of State for Air, said four bomber squadrons were to be converted to fighters. All twenty Auxiliary Air Force squadrons would now form part of the air defence of Britain.

Commandant of E.A.N.S.

GRP. CAPT. LEONARD KELLY BARNES, C.B.E., who spent last year attending the course at the Imperial Defence College, has been appointed Commandant of the Empire Air Navigation School at Shawbury, with the acting rank of Air Commodore, as from January 19th. He succeeds Air Comdre. N. H. D'Aeth, who has been Commandant since June, 1945, and has flown 90,000 miles in *Aries I* and *II*. On a recent liaison flight in *Aries II* to the U.S.A., he was made a member of a tribe of 48,000 Indians and named "Shanti Oheti-Ka," meaning "Brave Heart." Before going to the Imperial Defence College, Grp. Capt. Barnes was Director of Combined Operations (Air) and Chief of Staff at Combined Ops.

"Thor II" for South Africa

THE Avro Lincoln, *Thor II*, of the Empire Air Armament School, R.A.F., Manby, Lincs, is to visit Air Force stations in Middle East, and units in South Africa and Southern Rhodesia. The aircraft will leave R.A.F. Manston, Kent, on January 15th, and return on February 20th, carrying an armament specialist team of six R.A.F. officers from the staff of the Empire Armament School who will be accompanied by A.V-M. G. A. H. Pidcock, Director-General of Armament at the Air Ministry.

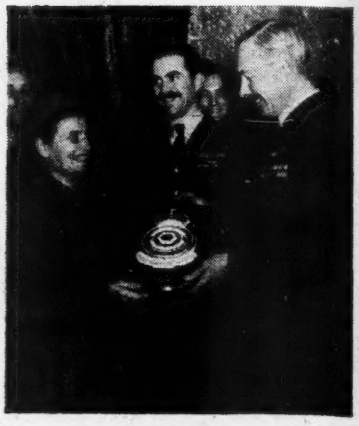
F/Sgt. Lewis Retiring

LEWIS, the fifteen-year-old goat mascot of No. 1 Technical Training School, R.A.F., at Halton, is to be placed on the retired list with the rank of Flight Sergeant. His place is to be taken by Lewis II, nine months old, who closely resembles his predecessor and was presented to the Commanding Officer of No. 1 Administration Wing of the School last June by Mrs. Liddington, wife of ex-F/Sgt. R. Liddington, a former member of the Medical Service. Lewis II has been understudying Lewis I since his arrival, and consideration is being given to his reclassification to L.A/C., provided he conducts himself well on ceremonial parades. For the time being he does not hesitate to emit high-pitched noises if asked to fall into line with parade discipline. But with gradual training and persuasion on the part of his handler, A.Apce. D. Collins, he should eventually be able to take over the duties of Lewis I.

Marine Branch

A NEW branch—the Marine Branch—has been set up in the R.A.F. Its main duties are the command of R.A.F. vessels and Marine Units, some related staff and marine engineering posts. The vessels include a flying-boat depot ship, two auxiliaries, which serve as radar and torpedo targets, high-speed target-towing craft, and numerous smaller types for bombing ranges and flying-boat stations. Most permanent officers will be drawn from regular N.C.O. coxswains, but if necessary additional officers may be drawn from other sources, such as from other Air Force officers with the necessary qualifications or from Merchant Navy officers. For the present, permanent officers will be chosen from marine officers holding emergency or extended service commissions.

There will be a few marine engineer posts, most of which will be filled by officers of the Technical branch of the Air Force. Those posts which require Ministry of Transport marine engineer certificates will be filled by recruitment of fully qualified Merchant Navy engineer officers or ex-naval engineer officers on a short service commission basis for five years' active list service, with a gratuity at the rate of £100 a year.



TOKEN OF THANKS: When a Mosquito night fighter crashed at the bottom of her garden recently, Mrs. Martha Atkinson dragged the navigator clear of the flames. Officers and men of the West Malling squadron, to which the machine belonged, suscribed towards a squadron crest, seen being presented to Mrs. At inson.

Reunions

THERE will be a reunion for personnel of No. 547 Squadron and 8547 S.E. at Holborn Restaurant, London, on January 31st, 1948, at 6.30 p.m. Tickets, price 20s each, from F/O. J. W. Daley, R.A.F. Station, Defford, Worcs.

* * *

A reunion dinner for officers and aircrew of No. 3 G.T.S. is to be held at The Victoria, 56, Buckingham Palace Rd., London, on January 31st, 1948. Tickets, 10s each, from G. A. T. Burdett, 5, Waterlow Rd., Highgate Hill, London, N.19.

* * *

The second annual reunion of No. 221 Squadron, R.A.F., Old Comrades' Association will be held in London on Saturday, March 13th, 1948. Tickets, 6s 6d, from the Hon. Sec., H. N. Crawshaw, 50, Elliscombe Rd., London, S.E.7.

A NAUTICAL NOSE: The wide-track long-travel undercarriage and the clean installation of the Bristol Centaurus 18-cylinder sleeve-valve radial engine are well shown in this "Flight" photograph of a Fairey Spearfish prototype.

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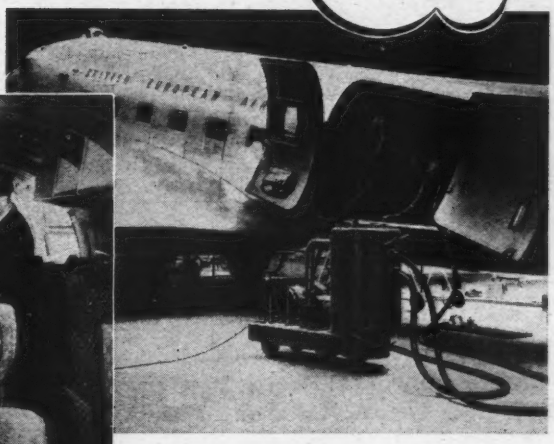

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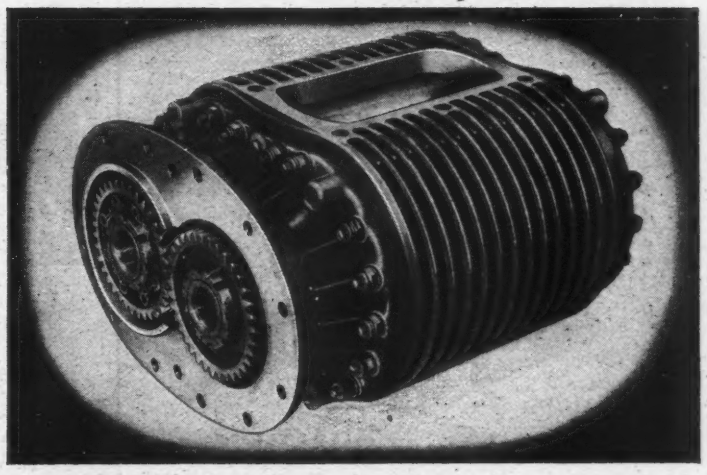

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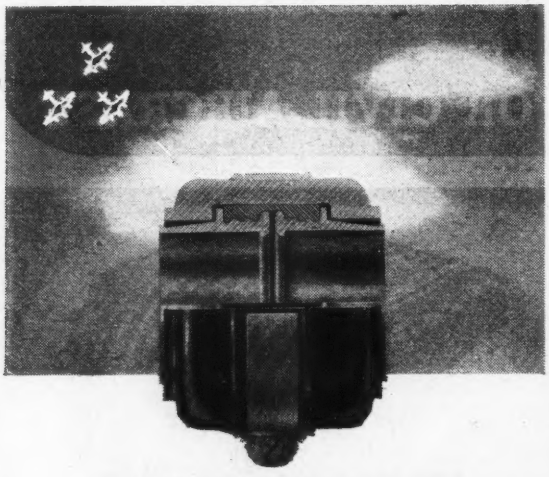

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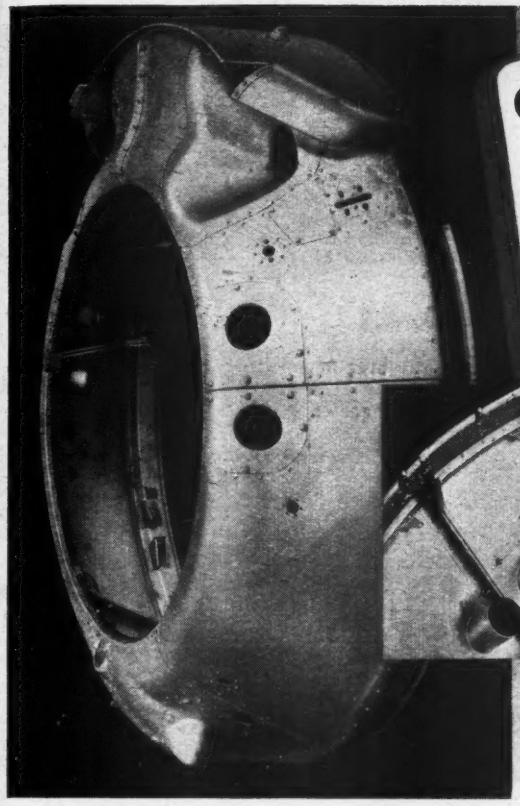

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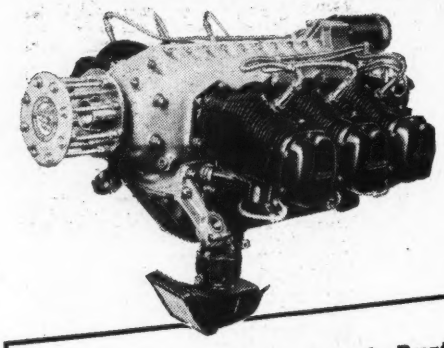

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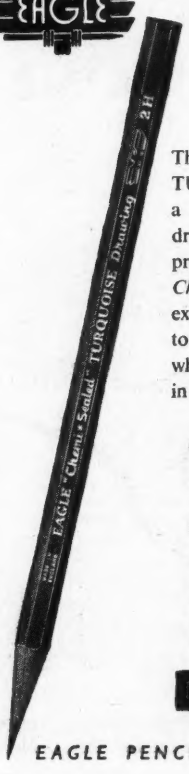

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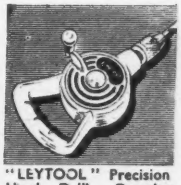

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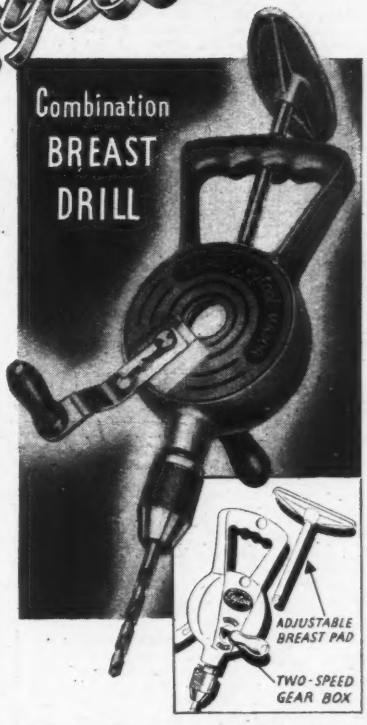

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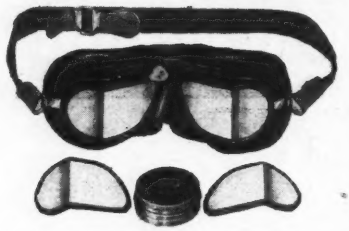

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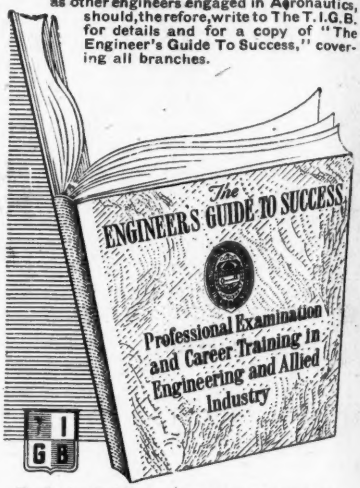

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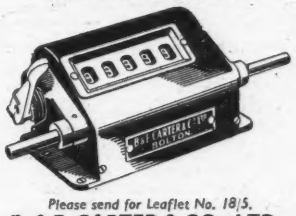

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CARAVANS for sale.—Eccles "Enchantress" 17ft 6in caravan, D/P, lantern roof; two double beds; two wardrobes; gas cooking and lighting; stainless-steel Pither stove; water tank and pump; centre kitchen; two doors.—F.O.C. Caravan Centre, 200, Cricklewood Broadway, London, N.W.2. Gladstone 2234. [0207

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MAGNIFICENT Beaverlamb coat: suit Naval or Air Force pilot, couponless; chest, 47; sleeve, 28; length, 49.—Box 4984. [1257

R.A.F. embroidered gold wire blazer crests; 24/- each.—Willeringhaus & Co., Ltd., 48, North Side, Streatham Common, London, S.W.16. [0378

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APPLICATIONS are invited for appointment as operations officers. Employment is mainly at Headquarters in London with a few posts at Divisional Headquarters in the provinces. Entry is normally into Grade III but a few appointments to Grade II may be considered for candidates with outstanding qualifications. The vacancies include a few posts requiring exceptional qualifications in navigation.

OPERATIONS officers Grade II or III in the Ministry of Civil Aviation may be employed on any of the following subjects:—Preparation of policy statements and briefs on Civil Aviation technical matters. Review of reports by international conferences on technical and operational matters. Statements of operational requirements and of their further developments. Co-ordination of planning and implementation of technical services including air traffic control, telecommunications, radio navigation aids, etc. Correlation of plans for ground and airborne installations. Operational aspects of existing technical services. Route plans and route survey from technical aspect. Policy planning and implementation of air traffic control. Development of air navigation, its techniques, equipment and instruments. Appreciations of the navigational aspect of radio aids to navigation. Production of aeronautical and approach and landing charts. Conduct of pilots and navigators examination for licences. Air safety and compilation of air safety regulations. All aspects of civil aviation training and training facilities. Policy and planning of civil aircraft requirements. Siting, planning lay-out and policy for design and development of State civil aerodromes and aerodrome lighting. Questions of legislation on air matters from a civil aviation technical aspect.

AT certain intervals in his career an operations officer will be required to serve as aerodrome commandant at a civil aerodrome where he will be responsible for all aerodrome services including telecommunications, flying controls, works and general ground services (other than aircraft maintenance).

CANDIDATES, who must be at least 23 years of age on 15th December, 1947, should either be university graduates or possess professional aviation qualifications and experience of a high standard, preferably with administrative experience. They must either be pilots with a sound knowledge of air navigation or if not qualified to fly an aircraft must possess practical air navigation experience at least up to the standard of a second class civil navigator's licence. Preference will be given to those who have flown twin or multi-engined aircraft and who are experienced in strument and night flying pilots. Additional assets will be a general knowledge of civil aviation history and practice and knowledge or experience of airline operating methods, traffic control, radio aids to navigation, meteorology, aerodynamics, aeronautical engineering research and development. The consolidated salary scale for Grade III is £425 at age 23 to £600 at age 30 or over, rising by annual increments of £25 to £650, and for Grade II £700, rising by annual increments of £25 to £900.

WHEN final complements are settled establishment will be offered within these complements to suitable officers. It is a condition of service that candidates must be prepared to serve anywhere in the United Kingdom.

CANDIDATES should apply by postcard for a form of application to the Ministry of Civil Aviation, Establishment Division (B), 10, Fleet Street, London, E.C.4, quoting reference Est/154. The latest date for the receipt of completed application forms is 6th February, 1948. Applications from overseas candidates, if not received by that date, will be considered in connection with vacancies which may arise during the next few months provided that they are received by 30th March, 1948; such applications may be by letter, giving date of birth and full details of qualifications and experience. [1250

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A and C engineers required—unrestricted preferred, but comprehensive range current types acceptable.

APPLY in writing, stating full details age, experience and licence, indicating whether prepared to travel abroad if necessary, to British Aviation Services, Ltd., 1, Great Cumberland Place, London, W.1. Mark application "B." [1276

STRESSMEN required.—Apply, stating qualifications, experience and age, to Personnel Officer, Westland Aircraft, Ltd., Yeovil. [1261

AIRCRAFT engineer, A, B, C, D and X licences, required by leading aviation company; excellent salary and prospects.—Reply to Box 4896. [1254

SENIOR stressman required.—Please send details of training, experience and salary required to Chief Technician, Gloster Aircraft Co., Ltd., Witcombe, Glos. [0369

SITUATIONS VACANT

GOVERNMENT of Southern Rhodesia.

CIVIL Aviation Department.

APPLICATIONS are invited for the following appointments:—

INSPECTOR of Aircraft. The qualifications required are as follows:—

(i) Training in aeronautical engineering—a full indentured apprenticeship or studentship with an organisation undertaking the construction and/or major repair and overhaul of aircraft. Drawing office experience an advantage.

(ii) At least five years' experience of the maintenance, major overhaul and repair of airframes and aero engines.

(iii) Aircraft Maintenance Engineer's licence in categories "A," "B," "C" and "D."

TELECOMMUNICATIONS Officer. The qualifications required are as follows:—

(i) Associate member of Institute of Electrical Engineering having specialised in radio engineering particularly in respect of civil aviation. Telecommunications and aeronautical navigation radio and radar aids.

(ii) A graduate of the Aeradio Telecommunication Research establishment or equivalent.

(iii) A minimum of three years' administrative experience either on active Service as a Chief Signals Officer or in a civil establishment in a grade not lower than Superintendent.

(iv) A minimum of five years' practical experience preferably in civil aviation on installation, maintenance and operation of civil aviation telecommunications and modern radio/radar navigational and landing aids. This experience should not have terminated at a date more than three months prior to the application.

(v) To be conversant with the latest civil aviation telecommunication procedures as typified in recent I C.A.O. documents.

Applicants for either post must possess educational qualifications at least up to School Certificate standard.

SALARY scale: £737×£33—£935 per annum for each post.

COST-OF-LIVING allowance of 10% is at present payable on the above salaries, children's allowances of £24 per annum for the first child plus £18 per annum for other children are also payable.

SUCCESSFUL applicants will be appointed on probation for 2 years, after which they will be eligible for transfer to the permanent establishment. A pensions fund is maintained by approximately 5% contributions of basic salary, and pensions are normally payable at 60.

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A SECOND-CLASS steamship passage and half the cost of similar passages for wives and dependent children will be borne by Southern Rhodesia Government.

FIRST-CLASS rail fare and half the cost of similar rail fare for wives and dependent children will be paid from port of disembarkation to Salisbury, Southern Rhodesia.

APPLICATION forms can be obtained from the Office of the High Commissioner for Southern Rhodesia, 429 Strand, London, W.C.2, and must be returned completed before the 21st January, 1948. [1268

PERCIVAL AIRCRAFT, Ltd., invite applications for the following vacancies in the Design Office, in connection with an active development programme.

FOUR design draughtsmen with extensive experience of major structures, two for wing section, and two for body; applicants to be conversant with latest strength requirements, materials, etc., and capable of developing their own schemes and projects.

ONE design draughtsman with a sound knowledge of control systems. U/C mechanisms and allied applications.

FIVE senior draughtsmen for detail schemes and for work in conjunction with the above.

ONE fully qualified senior stressman.

ONE weight estimator.

APPLICATIONS in writing, stating age, experience and salary required to Personnel Manager, Percival Aircraft, Ltd. Luton Airport, Beds [0368

CAMERA repairers wanted; applications invited for immediate employment or for employment at a later date.—C. R. C. 1 Crawford St. (corner Baker St.), W.1 [0380

SEVERAL aircraft draughtsmen, one jig and tool draughtsman and one experienced rate fixer, urgently required.—Reply Chrislea Aircraft Co., Ltd., Exeter Airport, Devon. [1253

WESTON, Ltd., Leixlip, Dublin, invite applications from ground engineers; applicants should state details of their experience and licences; experience of charter and school work preferred. [1259

SITUATIONS VACANT

THE Air Ministry has vacancies in the Meteorological Office organization for a number of civilian radio (Meteorological) mechanics to maintain radar equipment.

APPLICANTS must possess a knowledge of the fundamental principles of radio and radar and practical experience in the maintenance and use of electrical, radio, and radar instruments including cathode ray oscilloscopes.

PREFERENCE will be given to former Royal Air Force personnel and any other ex-servicemen possessing the requisite qualifications. Staff selected will be required to serve at any station at home or abroad and in the case of appointments at home units, will generally be expected to make their own arrangements for accommodation. Successful applicants will be engaged on a non-pensionable basis only, although prospects of later being placed on the permanent establishment are not ruled out. The commencing weekly wages in the United Kingdom are £6/5 per week (inclusive) for appointees 21 and over. Varying allowances are payable in addition to the basic wage for service in most overseas locations.

APPLICATIONS should be addressed to Air Ministry S.5.(b), Bush House, N.W. Wing, Aldwych, W.C.2. [1251

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APPLY by letter with full details of age, licence and past experience to British Aviation Services, Ltd., 1, Great Cumberland Place, London, W.1. Mark application I.A.E. [0402

EMPLOYMENT advice.—Members of the Brevet Flying Club seeking employment in a flying capacity are requested to contact the Welfare Officer, Brevet Flying Club, 11, Chesterfield St., Mayfair. Tel. Gro. 1417. [0392

THE De Havilland Engine Co., Ltd., require design and detail draughtsmen, preferably with experience in gas turbine and/or reciprocating engines.—Apply Personnel Office, De Havilland Engine Co., Ltd., Stag Lane, Edgware, Middx. [0400

WANTED, A, B, C, D engineers and A and C engineers and captains for airways company operating Dakotas in India; apply immediately stating terms and date of joining, immediate joining preferred.—Write A. Alagappan, 2, Dartmouth Park Ave., London, N.W.5 [1264

SAUNDERS-ROE, Ltd., have vacancies for senior design draughtsmen, stressmen, and aerodynamicists for flight performance calculations.—Applications, stating age, qualifications, experience and salary expected, should be sent to Personnel Officer, Saunders-Roe, Ltd., East Cowes, Isle of Wight. [1394

NORTHERN Rhodesia.—Ground engineer, A and C licences, Gemini and Cirrus II, required for maintenance and servicing of Gemini aircraft in Northern Rhodesia; salary £650-£700 per annum, according to experience.—Apply, stating age, experience, etc., to John Howard & Co., Ltd., 13, Buckingham Gate, S.W.1. [1252

APPLICATIONS are invited for senior test pilot with knowledge and previous experience of the prototype testing of aircraft; Empire Test Pilots' Course desirable but not essential; good pay and prospects for the right type of individual.—Write, stating age, experience, qualifications and salary required, to Box 4872. [0397

THE FAIREY AVIATION Co., Ltd., Heaton Chapel, Stockport, require stress analysts with not less than three years' general aircraft experience for work of a responsible nature on design and research in connection with a high-speed, all-wing research aircraft; 38-hour week; write, stating age, experience and salary required. [1233

HANDLEY PAGE, Ltd., have vacancies on their staff for technicians, including stressmen and aerodynamicists—preferably degree standard as well as senior design draughtsmen for extensive programme of very interesting work; good salaries and conditions, experience to Staff Officer, Handley Page, Ltd., Claremont Rd., Cricklewood, London, N.W.2 [1242

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EX-SERVICE pilot, B licence, 2nd Nav. licence, 500 hrs., twins, requires position, air or ground, home or abroad.—Box 4949. [1262

EX-TRANSPORT Command captain, B licence (Dakotas) and 2nd N., seeks flying post anywhere, 1,250 hours, 525 Dakota.—Box 4898. [1248

EX-R.A.F. flt./lt. pilot, Transport Command captain, 1,900 hours, B licence endorsed Dakotas and Proctors, 2nd Class Navigator's licence, above average assessments, practical experience of European and African air routes, requires position in civil aviation, available now; would ferry any aircraft to South Africa or part way.—Box 4897. [1249

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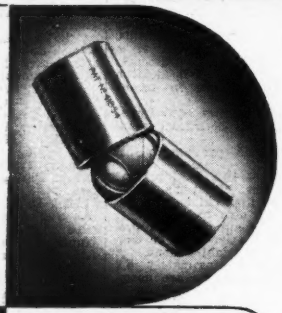

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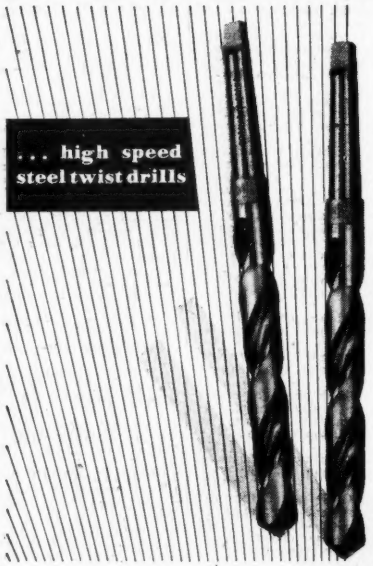

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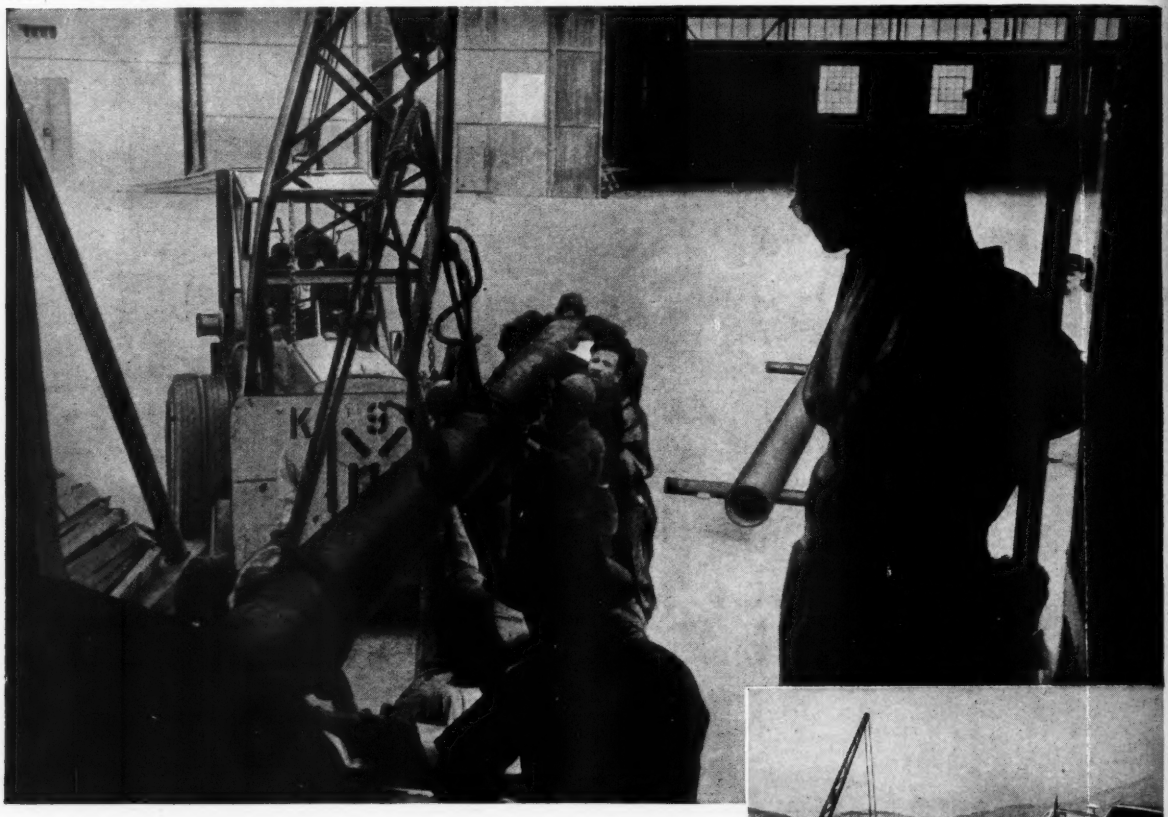
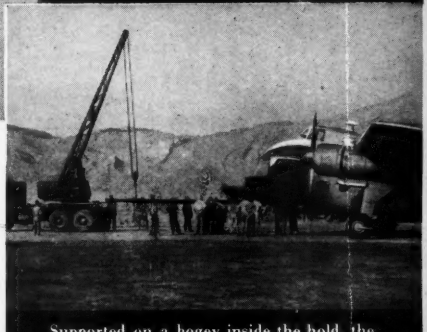
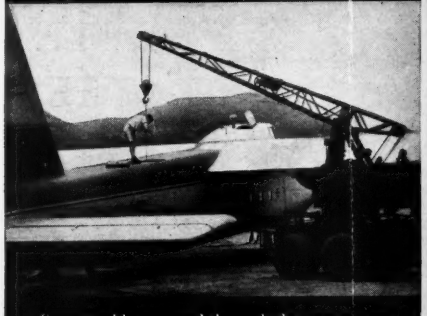
AIR FREIGHTING FEATS MADE POSSIBLE BY THE "BRISTOL" FREIGHTER—No. 4





Supported on a bogey inside the hold, the Rotary Kelly is eased aboard the Freighter.



Crane tackle operated through the rear escape hatch lowers the Rotary Kelly from its bogey.

The "Bristol" Freighter . . .

for transporting oil-well equipment

"We never refused a load and we never jibbed at an airfield"—in these words, the pilot summed up a "Bristol" Freighter's tour of the Middle East earlier this year. Behind his remark lay the memory of a fortnight spent in the broiling heat of the Persian Gulf, where, with temperatures touching 110 degrees Fahrenheit the aircraft operated from tiny air-strips, carrying oil-well machinery components measuring anything up to 35 feet in length, and weighing two to three tons. Most formidable of many awkward loads was the Rotary Kelly shown being loaded above. Nearly forty feet in length, and weighing over two tons, it provided a unique demonstration of the aeroplane's ability to carry cargoes which have never before travelled by air . . . further proof that, in the world of air transport, be it civil or military, the "Bristol" Freighter is unequalled as an aircraft built specifically for high-load air freighting.

Bristol — *reliable, economical easily-maintained aircraft*

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